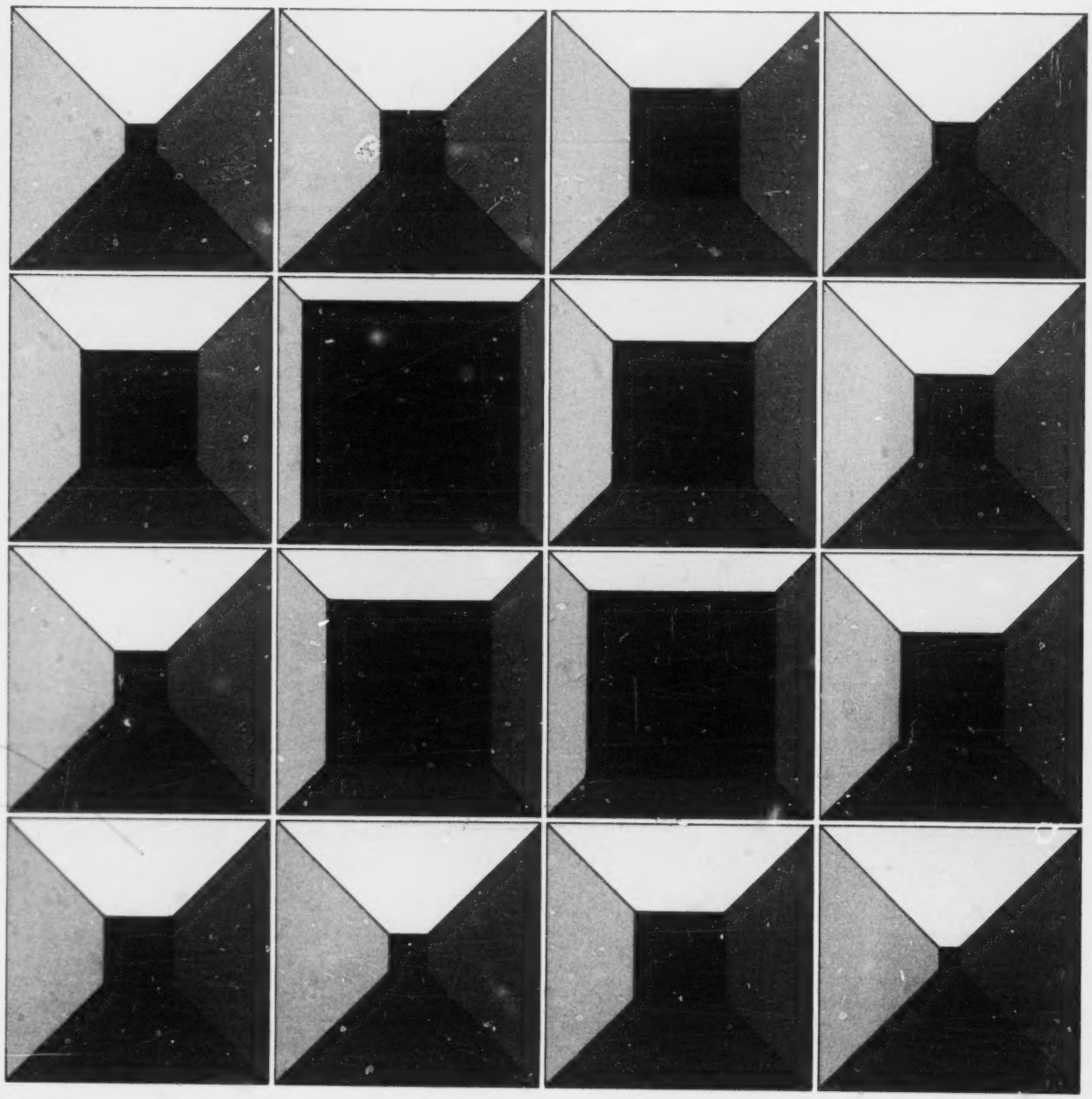
A CBO STUDY

Building a 600-Ship Navy: Costs, Timing, and Alternative Approaches

March 1982

Congress of the United States
Congressional Budget Office



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NOTE

Unless otherwise noted, all cost figures in this report are in fiscal year 1983 dollars.

PREFACE

As the Congress considers the defense budget for fiscal year 1983, one of the more important issues will be the Navy's shipbuilding program. The Administration has announced plans to increase U.S. naval forces in the interest of assuring maritime superiority over any likely enemy. A key aspect of this is a shipbuilding program that will modernize and increase the size of the U.S. fleet. This shipbuilding program will add substantially to costs, both in fiscal year 1983 and in the future.

This report, prepared at the request of the House Committee on Armed Services, examines the budget and schedule implications of shipbuilding programs that would achieve the Navy's force objectives. The report also examines possible alternatives to the Navy's program. (Two forthcoming companion reports consider implications of the buildup for aircraft procurement and manpower.) In accordance with CBO's mandate to provide objective and nonpartisan analysis, the report offers no recommendations.

This report was prepared by Peter T. Tarpgaard of the National Security and International Affairs Division of the Congressional Budget Office, under the general supervision of Robert F. Hale and John Hamre. Patrick Haar of CBO's Budget Analysis Division provided essential support to the project in preparing budget estimates. John Enns, Alan Shaw, Al Peden and others on the CBO staff contributed to the estimates of costs. John Wells of the Institute for Defense Analyses provided invaluable assistance in the assessment of U.S. shipbuilding capacity. The author gratefully acknowledges the helpful comments and assistance of Alfred Fitt and Greg Schulte of the CBO staff and of Dorothy Yufer and Ronald Feldman of the Center for Naval Analyses. (The assistance of external reviewers and contributors implies no responsibility for the final product, which rests solely with CBO.) Patricia H. Johnston edited the manuscript, and Nancy H. Brooks provided extensive editorial assistance. Jean Haggis and Janet Stafford prepared the report for publication.

Alice M. Rivlin
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SUMMARY

Once the indisputably dominant power at sea, the United States has seen this dominance erode over the past two decades as a result of steady growth in Soviet naval capabilities and declining force levels in the U.S. Navy. Between 1970 and 1980 the total number of ships in the U.S. Navy fell from 847 to 538 and uniformed personnel strength declined from 675,000 to about 525,000. Although the remaining ships are newer and more capable than those retired, the Navy now has substantially fewer ships with which to sustain its peacetime commitments or to conduct wartime operations. One result has been an operational pace in recent years nearly unprecedented in peacetime. The Chief of Naval Operations recently testified that "the Navy has been at virtually a wartime operating tempo since the beginning of the Vietnam conflict and has never stood down."

BUILDING THE FUTURE NAVY--STRATEGY CONSIDERATIONS

The Administration has announced plans to increase substantially U.S. naval forces, which are deemed to be inadequate. The specifics of these plans are based upon a maritime offensive strategy that emphasizes strikes against enemy forces and their supporting base structure, including strikes in enemy waters against its home territory. Carrier battle groups would be the primary instrument of such offensive action. The Navy believes that the most efficient way to maintain control of the seas is to destroy hostile forces capable of challenging that control. The Navy further holds that the very existence of such offensive forces would force the Soviet Union into a defensive, reactive position, allowing the United States to capitalize on Soviet geographic disadvantages and compelling the Soviet Union to concentrate its naval forces close to its homeland where they would pose less of a threat to U.S. sea lines of communication.

It is very likely that this strategy would evoke a strong Soviet response against the attacking battle groups, since it would involve direct assaults against Soviet territory. In the Navy's view, this dictates a requirement for highly capable--and therefore very expensive--weapons systems to defend against

intense Soviet attacks. Critics of this position, however, view the strategy as fundamentally unworkable and likely to provoke Soviet use of nuclear weapons against the battle groups. In this view, even the most sophisticated and expensive weapons would probably not be effective in protecting the battle groups against the intensive resistance that would be encountered in Soviet waters. A more realistic approach, in this view, might be to build a Navy capable of controlling and defending large areas of the ocean, including vital sea lanes and Third World areas, against a widely distributed Soviet threat. This approach would require a large fleet, but one with less need for the highly sophisticated weapons required for an offensive strategy.

BUILDING THE FUTURE NAVY--FORCE OBJECTIVES

The Navy's Force Objectives

Based on its strategy and its view of priorities, the Navy has developed specific objectives for future naval force expansion. The Navy believes that the fleet outlined in Summary Tables 1 and 2 is the minimum force needed to protect U.S. interests at sea, given currently foreseen conditions. This fleet would number over 600 ships (including the strategic force of ballistic missile submarines) of the types that support the Navy's requirements for accomplishing its wartime missions as the Navy currently perceives them.

The fleet envisioned by current Navy planners features 15 deployable aircraft carriers, with their associated air wings and battle group escorts, which would form the primary offensive strike forces. The carrier battle groups would be supplemented by four surface action groups (SAGs), which are naval combat groups not containing aircraft carriers. SAGs would probably be centered upon the four battleships that the Administration plans to reactivate.

Lift capability for amphibious forces--that is, forces capable of making a forcible invasion from the sea--would be increased about 50 percent to provide a capability to land a Marine Amphibious Brigade, or MAB (15,500 troops), in addition to the current ability to land a Marine Amphibious Force, or MAF (32,500 troops). The Navy has increased its force level goal for attack submarines from 90 to 100, and intends to replace its 25 old minesweepers with 31 new ships.

SUMMARY TABLE 1. NAVY FORCE OBJECTIVES

Forces	Number
Carrier Battle Groups	15
Surface Action Groups	4
Amphibious Lift	1 MAF a/ + 1 MAB b/
Underway Replenishment Groups	10
Nuclear Attack Submarines	100

a/ Marine Amphibious Force - 32,500 troops.

b/ Marine Amphibious Brigade - 15,500 troops.

SUMMARY TABLE 2. SHIP LEVELS FOR GENERAL PURPOSE FORCES

Ship Type	Number of Ships	
	Current Force	Objective
Combatants		
Aircraft Carriers	12	15
Battleships	0	4
Battle Group Escorts	112	137
Frigates	81	101
Attack Submarines	91	100
Small Combatants	5	--
Total Combatants	301	357
Other Ships		
Amphibious Ships	65	75
Mine Warfare Ships	25	31
Replenishment Ships	53	69
Material Support Ships	26	27
Fleet Support Ships	30	33
Total, Other Types	199	235
Ballistic Missile Submarines (SSBNs)	35	Unstated
Total, All Ships	535	592 + SSBNs

Finally, the underway replenishment force, which is vital for sustained operations at sea, would be built up to support the larger combat fleet. The number of support ships, including destroyer tenders and submarine tenders, which back up the fleet also would be appreciable.

Options I and II, among the program alternatives examined in this report, meet these Navy force objectives.

Alternative Force Objectives

There are many alternatives to the force objectives presented above. Very generally, these can be categorized as two types:

- Those that procure a different number of the same kinds of ships as proposed by the Navy; and
- Those that procure a different mix of ships.

This report examines an alternative of each type.

Alternatives of the first kind might logically derive from an assessment that the Navy's strategy and the specific ship types planned to implement that strategy are correct, but that the numbers of ships recommended are either unattainable within feasible budgets or are unnecessary for the levels of conflict anticipated in the future. This kind of alternative is examined as Option III.

Alternatives of the second kind--those that procure a different mix of ships--might derive from a different view of naval strategy or from a different view of how best to implement the Navy's strategy. This kind of alternative is examined in Option IV. This option would introduce three different ship types not currently included in Navy shipbuilding plans. It suggests directions in which ship design might proceed if it was decided to place more emphasis on distributed-force, open-ocean operations as opposed to concentrated offensive strikes.

BUILDING THE FUTURE NAVY--ALTERNATIVE APPROACHES

This report presents four alternative shipbuilding programs. These programs illustrate the budget and force structure implications of various approaches to future Navy shipbuilding.

Of the four options examined, two, Options I and II, would achieve the number and types of ships recommended by the Navy. Option I would reach these goals by 1992, which means the ships would have to be authorized no later than 1988. This is probably the shortest period of time in which the Navy's goals could be reached. Congress could decide to accomplish the same goals, but over a longer time. Hence, Option II would extend the authorization period from six to ten years, with authorizations extending through fiscal year 1992 and force goals substantially achieved by 1996.

Option III would be a lower cost alternative producing fewer ships, but one in which the kinds of ships procured would all be of the same types contained in current Navy plans. It would result in a substantially smaller fleet than Options I and II. Option IV would introduce some ship types not contained in current Navy plans. It would attain numerical force levels comparable to the Navy goals at a lower cost than Options I or II.

Appendixes A through D present details of the annual shipbuilding programs for each of these options and the resulting year-by-year force structure. Summary Table 3 provides a summary of the results.

Option I: Rapid Buildup to Navy Force Objectives

Option I would achieve the Navy's force goals in ten years, necessitating that authorizations be accomplished in six years since ships are generally not delivered until at least four years after authorization. This option would require authorization of 176 ships over the next six years at a total cost of $119 billion. (All costs in this report are in fiscal year 1983 dollars). This option is clearly the most desirable in terms of achieving the Navy's long-run objectives. It would result in a fleet structured to support the Navy's offensive strategy and would do so in a shorter time than any of the other options. Under Option I, the fleet would grow to 657 ships by the 1990s, including 15 deployable carrier battle groups.

This growth would, however, require an immediate and drastic increase in the Shipbuilding and Conversion, Navy (SCN) budget. SCN budget requirements for Option I are estimated to average about $25 billion annually over the next six years, or about 2 1/2 times the fiscal year 1982 authorization and 34 percent above the Administration's budget request for 1983. This $25 billion would

SUMMARY TABLE 3. SUMMARY OF SHIPBUILDING PROGRAM OPTIONS (Costs in billions of fiscal year 1983 dollars)

	Option I	Option II	Option III	Option IV
Timing				
Year goals met	1992	1996	1996	1996
Authorization period (in years)	6 a/	10	10	10
Ships				
Current force (End of 1981)	535	535	535	535
Retirements	152 a/	240	240	240
Now building or authorized	98	98	98	98
New authority	176 a/	230	146	231
Fleet total	657 a/	623	539	624
Program Requirements				
Total authorizations, ships	176 a/	230	146	231
Average annual number of ships	29.3	23.0	14.6	23.1
Total new construction cost	119 a/	170	97.0	121
Average annual new construction cost	19.8	17.0	9.7	12.1
Average annual total, Shipbuilding and Construction, Navy	24.8	21.3	12.1	15.1

a/ Option I is a six-year authorization program through fiscal year 1988, with ships assumed to be substantially all delivered by 1992. For Option I, therefore, the figures for retirements and fleet totals are through 1992 and authorizations are through fiscal year 1988. In all other options, the program period is four years longer, with authorizations extending through 1992 and the figures for retirements and fleet totals through 1996.

be higher than the amount required for new ships alone because the SCN budget contains funds for purposes other than construction of new ships, including conversions of existing ships, outfitting, post delivery costs, cost growth, and funds to cover unforeseen escalation. Over the past ten years, these items have averaged about 20 percent of the total SCN budget. In this report, therefore, it is assumed that funds required for new ships represent about 80 percent of the total SCN budget in any given year.

Option II: Slower Buildup to Navy Force Objectives

Option II would achieve the same force goals as Option I but would take four more years to attain them. Authorizations for Option II would be distributed over a ten-year period ending in 1992, with deliveries assumed to be substantially complete by 1996. A total of 230 ships would be authorized over the ten-year period in this option at a total cost of $170 billion. More ships would have to be constructed than in Option I because more older ships would be retired during the longer duration of Option II. This would translate into an average annual expenditure of $17.0 billion for new ship construction or (assuming an 80 percent share of SCN for new construction) a total average SCN budget of $21.3 billion per year for ten years. This would be a lower annual average expenditure than Option I but still over two times the SCN budget for fiscal year 1982 and about 16 percent more than the Administration's request for 1983.

It should be recognized that, when viewed over a longer time frame, Options I and II are in fact the same since both eventually attain the same force goals. They are treated here as two options and viewed over different time periods in order to investigate the effects of timing and scheduling on the budgetary requirements for a naval force expansion program. Although the long-term budgetary requirements for these two options should be about the same, the nearer-term budget implications would be substantially different.

Option III: Budget Constrained Program

Option III illustrates the force levels that might result if the Navy continued to procure the same types of ships as currently planned, but with the shipbuilding budget constrained to more modest growth. In Option III, it was assumed that the budget for new construction was limited to a level of about $10 billion per year (or $12.5 billion for the total SCN budget).

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The Navy resulting from Option III, that is a Navy constrained to modestly increased budget levels and currently programmed ship types, would contain about 540 ships in the mid-1990s, about the same number as the current force. The mix of ship types in Option III would correspond to those in the Navy's plans but at the lower numbers dictated by constrained budgets. The resulting fleet would include 12 carrier battle groups instead of 15 and lower force levels in most other categories--levels that would closely resemble the force goals of the previous Administration.

Option IV: Expanded Navy of Modified Force Mix

Option IV would provide the higher numerical force levels of Options I and II but at lower cost. It would include a somewhat different mix of combatant ships than those in current Navy plans--a mix motivated by an emphasis on open-ocean, distributed-force operations as opposed to emphasis on concentrated offensive strikes.

Distributed-force, open-ocean operations require ships that can surveil large areas and can engage enemy units--surface, subsurface, or airborne--at long range. Ships for these operations, therefore, should have helicopters or vertical/short take-off and landing (V/STOL) aircraft for long-range surveillance and targeting, towed-array sonar systems for long-range submarine detection, cruise missiles, and long-range anti-air warfare (AAW) capability. Option IV would include a total of 73 new surface combatants of types well-suited to distributed-force operations but not currently included in Navy construction plans. These include 12 guided missile aviation cruisers (CGV) and 61 guided missile destroyers (DDGY).

The CGVs would be equipped with a balanced suite of ship-mounted anti-air, antisubmarine, and antisurface weapons, including vertically launched missiles. Their principal feature, however, would be a flight deck and support facilities for eight to 12 V/STOL aircraft or helicopters--an air group large enough to provide a sustained airborne surveillance capability for a naval force not containing an aircraft carrier.

The DDGY is a general purpose surface combatant also equipped with a balanced suite of anti-air, antisubmarine, and antisurface weapons. It would have a modern (but non-AEGIS) AAW system, a towed-array sonar, and vertically launched missiles. Its flight

deck and aviation support facilities would be adequate for two helicopters (or future V/STOL aircraft) for extended surveillance, targeting, and attack. These ships, with their ability to provide a naval presence and force over a large ocean area, could be used in a wide variety of missions from offensive strikes to patrol and presence operations.

Option IV would also call for resuming construction of nonnuclear attack submarines of an upgraded and modernized type to supplement the nuclear submarine force. These are suggested not because they are more capable on a ship-to-ship basis than nuclear submarines but because of their cost advantage. Some important submarine missions, such as barrier patrols, could be performed adequately by nonnuclear submarines, and some argue that diesel-electric submarines, because they are very quiet and difficult to detect when operating on battery power, would actually be more effective than nuclear submarines for some missions. The approximately three-to-one life-cycle cost advantage of diesel-electric submarines over current nuclear attack submarines would provide a larger submarine force, and, therefore, the flexibility inherent to more units, for a given investment. Thus, as a supplement to the nuclear force, diesel-electric submarines could be assigned to missions for which they are suited and free nuclear submarines for more demanding tasks.

Option IV would procure 231 ships over ten authorizing years at a total cost of $121 billion. This would correspond to an average annual program of $12.1 billion for new construction or about a $15.1 billion average annual total SCN budget requirement. This budgetary requirement would fall between the force sustaining investment level of Option III and the sharply increased budget levels of Options I and II.

INDUSTRY AND NAVAL FORCE EXPANSION

The four options considered above were analyzed for their effect on the U.S. shipbuilding industrial base, with the aid of a computer model called the Institute for Defense Analyses Ship Allocation System (IDASAS). The results indicated that all of the options were well within the capacity of the current shipbuilding industry, assuming, of course, some growth in shipyard employment levels.

The major problem in the shipbuilding industry at present is not the physical capacity to respond to any anticipated Navy

buildup, but rather one of staying in business in the face of a disappearing demand from commercial ship operators. Compared to 1972 and 1973, when U.S. shipbuilders received new orders for 48 and 43 merchant ships, respectively, of 1,000 gross tons and over, only seven vessels were ordered in 1980 and six in 1981. The government, therefore, has become almost the sole remaining customer for this industry and government actions are likely to be key determinants of the size and capabilities of the industry in the future.

TOTAL NAVY BUDGET UNDER FOUR OPTIONS

The costs outlined for each of the above options and explained in more detail in the appendixes are only those in the Shipbuilding and Conversion, Navy (SCN) budget. Additional costs--including funds for such things as operations, maintenance, manpower, weapons, and aircraft procurement--are interrelated and spread across a wide spectrum of activities. Calculating them is a complex and laborious process. The Congressional Budget Office (CBO), however, has developed a computer model, called the Defense Resources Model (DRM), that automates this process and enables CBO to compute relatively rapid estimates of the overall budgetary effects of changes in procurement plans.

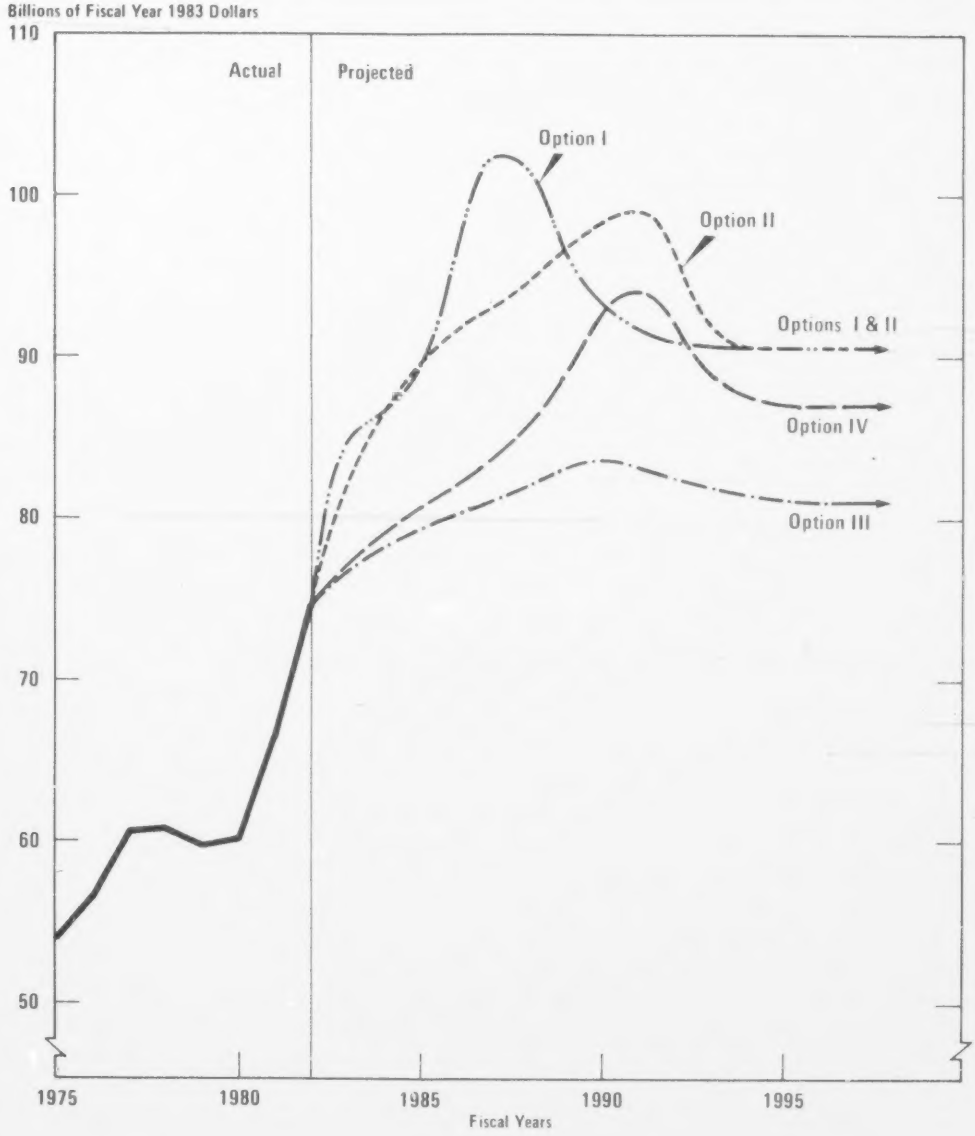
Projections of the Navy's overall budget requirements under each of the four options, as estimated with the help of the DRM, are shown in the Summary Figure. The required budget authority rises sharply to a peak in order to effect a rapid force buildup and then settles back to a somewhat lower sustaining budget level. This effect is most pronounced for Options I and II, with Option I--the accelerated buildup--peaking several years before Option II. Option IV--the 600-ship option with a different force mix--shows a similar trend but at a somewhat lower level. Option III--which basically maintains current force levels--also requires some growth in real budget authority but at a much more modest level. Tables showing these estimates in detail are provided in Chapter V.

THE ADMINISTRATION'S FIVE-YEAR SHIPBUILDING PLAN

The five-year shipbuilding program proposed by the Administration in the fiscal year 1983 budget is shown in Summary Table 4. It proposes authorization of 133 new ships and 16 conversions, service life extension program (SLEP) overhauls, and

Summary Figure.

Navy Budget Authority Since 1975 and Projected to 1995 Under Four Program Options



SUMMARY TABLE 4. ADMINISTRATION'S PROPOSAL SHIPBUILDING PROGRAM FOR FISCAL YEARS 1983-1987

Type of Ship	1982 a/	1983	1984	1985	1986	1987	1983-1987 Total
Trident (Ballistic Missile Submarine)	--	2	1	1	1	1	6
SSN-688 (Attack Submarine)	2	2	3	4	4	4	17
CVN (Aircraft Carrier-Nuclear)	--	2	--	--	--	--	2
CV (Aircraft Carrier) SLEP b/	--	1	--	1	--	1	3
CG-47 (Guided Missile Cruiser)	3	3	3	3	4	4	17
CG-42 (Nuclear Guided Missile Cruiser)	--	--	--	--	--	1	1
DDG-51 (Guided Missile Destroyer)	--	--	--	1	--	3	4
DD (Destroyer)	--	--	--	--	2	1	3
BB (Battleship) Reactivation	1	1	1	1	--	--	3
FFG-7 (Guided Missile Frigate)	3	2	2	2	3	3	12
MCM (Mine Countermeasure Ship)	1	4	4	5	--	--	13
MSH (Mine Countermeasure Ship)	--	--	1	--	5	5	11
LSD-41 (Landing Ship Dock)	1	1	1	2	2	2	8
LHD-1 (Amphibious Ship)	--	--	1	--	--	1	2
AOE (Multipurpose Stores Ship)	--	--	--	1	1	2	4
AE (Ammunition Ship)	--	--	--	1	2	1	4
ARS (Salvage Ship)	2	1	1	--	--	--	2
AD (Destroyer Tender)	--	--	--	--	1	1	2
T-AO (Oiler)	1	1	3	4	4	6	18
T-AGS (Ballistic Missile Submarine Support Ship) Conversion	--	--	--	2	--	--	2
T-AK (Cargo Ship) Conversion	--	--	--	1	--	--	1
T-ARC (Cable Ship)	--	--	--	--	1	--	1
T-AGM (Range Instrumentation Ship) Conversion	--	--	--	--	1	--	1
T-AGOS/AGOS (Surveillance Towed Array Sensor System)	4	--	1	--	2	3	6
T-AKRX (SL-7) Conversion c/	4	4	--	--	--	--	4
T-AFS (Stores Ship) Conversion	2	--	--	--	--	--	--
T-AH (Hospital Ship) Conversion	--	1	1	1	--	--	2
New Construction Ships	17	18	21	24	32	38	133
Conversions/SLEPs/ Reactivations	7	7	2	2	1	1	16

SOURCE: Department of Defense

NOTE: All ships, conversions, and service life extensions are proposed to be authorized in the year listed. They will not enter the fleet until later years.

a/ Included to provide comparison with the Administration's program.

b/ SLEP = Service Life Extension Program.

c/ Acquisition of eight T-AKRXs will be completed in fiscal year 1982.

reactivations in fiscal years 1983 through 1987. Although this five-year program, estimated to cost over $80 billion in fiscal year 1983 dollars, is more ambitious than previous programs submitted to the Congress over the past few years, it would not accomplish all of the Navy's goals. It is, perhaps, closest to Option II of this report, but does not contain sufficient ships, particularly surface combatants, to reach many of the Navy goals for specific ship types. In addition, this plan--as has been the case with so many previous shipbuilding plans--places procurement of most of its ships in the later out-years. Over half of the 133 ships of this five-year plan appear in the last two years. Achievement of the Navy's force level goals, therefore, would require adhering to at least the authorization levels contained in the out-year building plans and continued high levels of construction in the years beyond fiscal year 1987.

BUILDING THE FUTURE NAVY--DIFFICULT CHOICES

Consideration of the four program options discussed above suggests some important conclusions regarding the Navy's current force expansion plans. Options I and II indicate that building up to the force levels proposed by the Navy with the kinds of ships currently programmed, could not be accomplished without increasing shipbuilding and total Navy budgets to levels well above recent peacetime practice. Option III indicates that, if the Navy continued to procure the kinds of ships currently programmed, some real budget growth would be required even to maintain current force levels. Attainment of the currently stated force goals within the bounds of even fairly vigorous real growth in budget authority might not be achieved unless successful efforts could be mounted to develop less costly warships, such as those suggested in Option IV.

Not only is the Navy's shipbuilding program very expensive, but it is predicated upon an offensive strategy that is, in the opinion of some observers, dangerously provocative in a nuclear-armed world and very hazardous to U.S. carrier forces even if a nuclear exchange is avoided. Critics of the Navy's strategy argue that the U.S. should turn away from the current emphasis on offensive strikes into Soviet waters--strikes which, they feel, would be likely to result in more damage to irreplaceable carrier battle groups than to Soviet forces--and emphasize instead the development of a Navy with distributed offensive capability, able to control large areas of the ocean, including vital sea lanes and strategically important areas in the Third World. Such

a Navy, it is argued, would be better able to protect U.S. interests across a wider spectrum of future contingencies.

The Congress, therefore, must not only consider the budgetary implications of future shipbuilding programs but also the wisdom of the naval strategy assumptions upon which those programs are based.

CHAPTER I. INTRODUCTION

One of the most widely known and discussed defense goals established by the Administration is naval force expansion, or the "600-ship Navy." Convinced that currently operational naval forces are inadequate to support fully existing U.S. worldwide commitments and possible future contingencies, the Administration has proposed a substantial buildup of naval forces. Although the proposed expansion would be a many-faceted program involving more than just increasing the number of ships in the Navy, the term "600-ship Navy" has become the commonly used catchword for describing this goal.

A gross ship total, such as 600 ships, can be justifiably criticized as an inadequate indicator of naval strength. It says nothing about ship capabilities or such other key factors as aircraft, manpower, training, logistics, maintenance, modernization, and a host of other items vital to the effectiveness of a modern Navy. Despite this, the term 600-ship Navy does serve as useful rhetorical shorthand in discussing the proposed buildup and it is a convenient index with which to measure a balanced naval force expansion.

This proposed naval program is a very large undertaking. It will require a substantial increase in budgetary authority for the Navy which will have to be sustained over a period of many years. Decisions made now in shaping such a program will influence the structure and capabilities of U.S. naval forces well into the next century. This raises many important issues for the Congress, including the following:

- What is the rationale for a naval force buildup?
- What forms can such a buildup take?
- How long will it take?
- What are the budgetary implications of the proposed buildup?

This report examines these issues. In particular, it analyzes the ship-related aspects of the proposed naval expansion with regard to procurement costs and schedules, effects on the shipbuilding industry, naval manpower, and operation and maintenance (O & M) requirements.

The importance of these issues is highlighted not only by the long-term national security implications cited above, but by the sheer magnitude of the expenditures involved. The Congressional Budget Office (CBO) estimates that a program to build the fleet of ships recommended by the Navy would cost at least $170 billion in ship procurement alone over a period of ten years. Assuming an 80 percent share for new construction in the Navy's shipbuilding and conversion (SCN) budget, this would imply an average annual budget requirement of $21.3 billion for SCN, more than twice the amount authorized in fiscal year 1982. Moreover, a Navy buildup would involve additional procurement in other categories, such as aircraft and weapons, and additional costs for manpower and operations in sustaining a larger fleet. Indeed, the total Navy budget would have to grow to a level nearly 40 percent above that for fiscal year 1982 (in fiscal year 1983 dollars) to accomplish the buildup, and would then settle to a level about 25 percent higher than fiscal year 1982 to sustain the larger fleet.

Chapter II of this report describes the Navy's plan for expanding naval force levels and presents the rationale underlying this expansion. Chapter III presents four options for future Navy shipbuilding, using various numbers and mixes of ships. These options are defined in more detail in the appendixes. Chapter IV discusses the industrial base necessary to support building ships for an expanded Navy. Chapter V analyzes the aggregate costs of naval force expansion and projects total Department of the Navy budgetary requirements under each of the four options. Chapter VI discusses the Administration's proposed five-year shipbuilding program for fiscal years 1983-1987.

All cost figures in this report, unless otherwise noted, are in terms of fiscal year 1983 dollars.

CHAPTER II. RATIONALE FOR THE 600-SHIP NAVY

Once the unequivocally dominant power at sea, the U.S. Navy has seen this dominance erode over the past two decades as the result of a vigorous expansion by the Soviet navy in both the numbers and sophistication of its forces. During the past decade, Navy witnesses before the Congress have delivered increasingly hedged assessments about the degree of naval superiority enjoyed by the United States. Finally, in his testimony last year, the Chief of Naval Operations refused to claim any margin of superiority for U.S. naval forces. In his testimony, he stated:

> . . . it would be misleading to continue speaking of a 'narrow margin' when, in fact, we have entered a period in which any reasonable estimate of the balance falls within the range of uncertainty. In other words, the situation today is so murky one cannot, with confidence, state that the U.S. possesses a margin of superiority. 1/

U.S. VERSUS SOVIET NAVAL FORCES

The Soviet navy has improved substantially in the past 25 years. In the categories of major surface warships and amphibious ships alone, Soviet force levels grew from about 260 in the mid-1960s to 362 in 1980. Concern about the relative naval balance, however, is not so much the result of simple numerical comparisons. It is, rather, the result of qualitative trends and of the rapid evolution of the Soviet navy from a force of modest capabilities oriented toward coastal defense to a modern, blue-water force capable of posing a serious threat to the U.S. Navy anywhere in the world.

1/ Testimony of Admiral Thomas B. Hayward, USN, Chief of Naval Operations, in Department of Defense Appropriations for 1982, Hearings before the Subcommittee on Defense, House Committee on Appropriations, 97:1 (March 1981), Part 1, p. 540.

A recent publication of the Department of Defense (DoD) estimated the size of the Soviet fleet at over 2,400 ships. 2/ A cursory examination of such fleet comparisons could lead to unwarranted alarm if the numbers were not put in the proper context. The large number of ships in the Soviet fleet is mostly accounted for by relatively small ships of modest capability. This impressive Soviet ship total does show, however, that, despite its recent emphasis on capable and expensive warships, the Soviet Union has also retained the large number of "low-mix" ships built to defend its extensive coastal areas and to support the four-fleet posture that geography imposes upon it. 3/

During the decade of the 1970s, the Soviet navy introduced 12 new classes of ocean-going warships, all equipped with modern, sophisticated weapons and electronics systems. At the same time, the Soviet Union adopted a distinctly more assertive stance in deploying its naval forces at sea, with Soviet naval groups appearing on a regular basis in areas such as the Mediterranean Sea where the U.S. had long been accustomed to unchallenged naval domination. The U.S.S.R. also demonstrated its new naval capabilities and tactics in large-scale exercises called "Okean," in which Soviet forces launched closely coordinated attacks against "enemy" forces clearly intended to represent U.S. carrier battle groups. A key element of the Soviet tactical approach was use of cruise missiles, launched by airplanes, submarines, and surface ships, for long-range attack. This aggressive new Soviet posture and the steady growth in the numbers of modern ships and weapons has created a challenge that is troubling to U.S. naval planners.

THE U.S. NAVY TODAY: LARGER COMMITMENTS--SMALLER FLEET

While the Soviet Union was expanding its naval capabilities, the U.S. Navy suffered substantial declines in some widely watched indicators of naval strength. Between 1970 and 1980, the number of ships operated by the U.S. Navy fell from 847 to 538 and uniformed personnel strength declined from 675,000 to about 525,000.

2/ Department of Defense, Soviet Military Power (U.S. Government Printing Office, 1981), p. 40.

3/ The Soviet Union maintains fleets in the North Atlantic, North Pacific, Black Sea, and Baltic Sea.

The ships remaining in the fleet are newer and more capable than those that have been retired but, nevertheless, the Navy has substantially fewer ships with which to sustain its peacetime commitments or to undertake wartime operations than in the past. 4/

In the meantime, demand for naval patrol and presence operations in response to world tensions has increased. This has been true most notably in the Middle East where the United States now maintains a substantial naval force in waters on the other side of the world from the continental United States. The strains created in responding to these demands were recently described by the Chief of Naval Operations in these terms:

> The records for continuous underway time established by our recent Indian Ocean deployers have exceeded those experienced during any conflict involving U.S. naval forces in this century. The fact is that the Navy has been at virtually a wartime operating tempo since the beginning of the Vietnam conflict, and has never stood down. Today the average ship's operating tempo actually exceeds Vietnam levels by about fifteen percent. 5/

4/ Not only are the ships remaining in the fleet generally more capable than those retired but the Navy has found other ways of accomplishing functions performed by some former ships. For example, the fleet of 1970 contained four anti-submarine warfare (ASW) carriers (CVS) and their associated escort and support forces. Today's ASW capability, using fixed surveillance systems, land-based patrol aircraft, and more advanced sea-based ASW aircraft on attack carriers is almost certainly superior to any capabilities possessed by the old CVSs. Similarly, the decline in mine warfare ships is at least partially offset by the development of minesweeping helicopters (although such helicopters have no minehunting capability), and a decline in the numbers of fleet tugs has been offset by increased use of civilian charters.

5/ Testimony of Admiral Thomas B. Hayward, USN, in Department of Defense Appropriations for 1982, Hearings, Part I, pp. 537-38.

THE FUTURE NAVY--THE NAVY'S PLAN

The Administration has provided the Congress with specific recommendations for the number and kinds of ships required to perform the Navy's missions. These recommendations derive from the Navy's current strategy for naval warfare in the event of conflict with the Soviet Union. This section briefly describes the Administration's force recommendations and their underlying rationale. 6/

The Navy's View: Carrier Battle Groups Are Key to Victory at Sea

The Navy believes that the most efficient way to gain and maintain control of the seas during wartime would be to destroy hostile forces capable of challenging that control. 7/ This would include frontal assaults against Soviet naval forces and their supporting bases in Soviet home waters. Aircraft carrier battle groups would be used as the instrument of such offensive action. The Navy believes that the very existence of such offensive forces would force the Soviet Union into a defensive, reactive mode, allowing the United States to capitalize on Soviet geographic disadvantages and compelling the Soviets to concentrate their naval forces in areas close to the Soviet Union where they would pose less of a threat to U.S. sea lines of communication. 8/

The usefulness of carrier battle groups would by no means be limited to direct confrontations with the Soviet Union. In the Korean War and again in Vietnam, aircraft carriers were

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6/ Navy force objectives (ship numbers and types) presented in this section are based on Hearings on Military Posture and H.R. 2970, Hearings before the Subcommittee on Seapower and Strategic and Critical Materials, House Committee on Armed Services, 97:1 (February, March, and April 1981), Part 3, pp. 441-75.

7/ Testimony of Admiral Thomas B. Hayward, USN, Chief of Naval Operations, in Military Posture and H.R. 6459, Hearings before the Subcommittee on Seapower and Strategic and Critical Materials, House Committee on Armed Services, 96:2 (February and March 1980), Part 3, p. 361.

8/ Ibid.

heavily involved in conducting tactical air strikes and providing air support for ground forces. A recent Brookings Institution study examined the actual use of military forces in promoting U.S. political objectives in the period 1946-1975 and found that naval forces were involved in 177 of the 215 incidents studied, more than half of which involved aircraft carriers. 9/ Carriers remain the only means of very quickly aggregating a substantial amount of tactical air power on short notice in most areas of the world. Carrier battle groups are, therefore, an important instrument of national power in a wide range of conflict scenarios, including Third World crises, and can be expected to remain so for the foreseeable future.

In addition to carrier battle groups, the Navy's offensive forces include surface action groups (SAGs), which are naval combat units that do not contain an aircraft carrier. They have been used in the Middle East and the Caribbean, and might be a form of response appropriate to other crises in the Third World. Their offensive capability will be considerably enhanced by the availability of cruise missiles and might be further improved in the future by deployment of vertical/short-takeoff and landing (V/STOL) aircraft aboard small carriers or "air-capable" ships. The concept of surface action groups gives surface combatants an independent offensive mission once again and provides the Navy with additional flexibility in the employment of its forces.

The Navy intends to maintain and, in fact, substantially improve its capabilities for supporting amphibious operations. Amphibious operations, that is the forcible landing of troops (Marines) from sea against enemy resistance, are complex and difficult. The U.S. Navy and Marine Corps developed this military art to a high degree during World War II and have attempted to continue improving their amphibious capabilities since that time. The Administration has proposed a 50 percent increase in the lift capacity (numbers of troops and amount of equipment that can be transported) of U.S. amphibious forces.

In addition to these offensive roles, the Navy would continue to shoulder important defensive responsibilities in the event of war. It would be vital to keep open the sea lines of

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9/ Barry M. Blechman and Stephen S. Kaplan, Force Without War (Washington, D.C.: The Brookings Institution, 1978), pp. 38, 41.

communications (SLOCs) connecting the United States with its allies and its economic trading partners. The Navy would accomplish this with barriers (across geographic choke points used by the Soviet fleet), with maritime air patrols, and with convoy escorts. Similarly, the logistics chains supporting military and naval operations around the world would have to be protected and/or provided by the Navy. All of this would require a large and capable fleet of ships.

The rest of this chapter discusses more specifically and in more detail the types and numbers of ships the Navy believes are necessary for performing its missions.

Ship Counting Methodology

When speaking of force levels, it is important to be clear as to which things are counted and which are not. DoD has recently adopted a specific policy in this regard for naval ships. In discussing the 600-ship Navy or other issues relating to fleet size, the ships counted are only those that contribute to the Navy's wartime missions through combat or direct support of combat operations. These kinds of ships are shown in Table 1.

TABLE 1. SHIPS INCLUDED IN NAVY FORCE LEVEL GOALS, BY TYPES

Strategic Forces	Support Forces
Ballistic Missile Submarines (SSBN)	Material Support Ships (AD/AS/AR)
Battle Forces	Fleet Support Ships (ATS/ATF/ASR/ARS/ AGOS/TAGOS/TATF)
Aircraft Carriers (CV/CVN)	Major Mobilization Forces
Battleships (BB)	Reserve ships that would participate in combat or direct combat support
Cruisers/Destroyers (CG/CGN/ DD/DDG)	
Frigates (FF/FFG)	
Attack Submarines (SS/SSN)	
Amphibious Ships (LHA/LHD/LPD/ LSD/LST)	
Replenishment Ships (AOE/AOR/AO/ AE/AFS)	
Small Combatants (PG/PHM)	
Mine Warfare Ships (MSO/MCM/MSH)	

Not included are indirect support auxiliaries, prepositioning and sealift ships, and mobilization forces not likely to engage in combat or direct combat support. About 36 ships now operated by the Navy fall into these excluded categories.

Carrier Battle Groups

During the past 25 years, the Navy has traditionally deployed aircraft carriers, with their associated escorts and support ships, in the Mediterranean Sea and in the Western Pacific. Until recently these standing deployments consisted of two carrier groups in the Mediterranean and two in the Western Pacific. Deteriorating conditions in the Middle East have now given rise to a requirement for forces in the Indian Ocean as well. As a result, the Navy now maintains five deployed carriers --usually a task force containing a carrier in the Indian Ocean, plus two carriers each in the Mediterranean and the Western Pacific. These five deployments are currently sustained by a force of twelve deployable carriers. 10/ This situation is part of the strained operating tempo cited by the Chief of Naval Operations. A more comfortable and sustainable posture would be to have three carriers in the force for each one deployed. This would provide for a more orderly rotation of ships to deployment stations, provide time for periodic maintenance, time ashore for the crew, and more ships to respond to unforeseen contingencies. These considerations, as well as an underlying concern that twelve carriers might be inadequate in wartime, have motivated the Navy's request to expand its force from 12 to 15 deployable carriers.

Expansion to a force of 15 carriers would require growth in other forces as well. The Navy would need enough additional escort and logistics ships to support the three new carriers. This would generate a requirement for about 26 additional surface

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10/ There are actually 13 carriers in commission but one is undergoing an extensive refit under the Service Life Extension Program (SLEP). The planned continuation of SLEP will have one carrier in a nondeployable status at all times until the end of the century. In addition, the Navy maintains one older carrier, Lexington, as an aviation training ship. Lexington currently has no air group or aircraft support capability and could not be deployed.

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combatants and 8 underway replenishment ships. 11/ In the Navy's plan, these would include a large proportion of highly capable and very costly surface combatants, such as the CG-47-class cruiser and the planned DDG-51-class destroyer.

Clearly, additional air groups would also be required for the new carriers, necessitating procurement of additional aircraft and expansion of the naval aircraft support structure. This issue is addressed in a companion CBO study, The Budgetary Implications of Modernizing and Expanding Carrier-Based Air Forces (forthcoming).

Surface Action Groups

The Navy also proposes, in their future force planning, to form four surface action groups (SAGs), which are smaller battle groups not containing aircraft carriers. An obvious role for the four Iowa-class battleships that the Navy plans to reactivate would be to serve as the centerpiece of these surface action groups. The Navy envisions future SAGs as consisting of a battleship, a CG-47-class cruiser, and three DDG-51-class destroyers. Equipped with cruise missiles, SAGs would be essentially equivalent to current Soviet battle groups and could operate as offensive strike groups in areas of moderate enemy threat. Using their guns as well as cruise missiles, they could be particularly effective in operations against coastal target areas and in support of amphibious operations.

Modification plans for the late 1980s could include fitting the battleships with a flight deck and support facilities for a detachment of vertical/short-takeoff and landing (V/STOL) aircraft or helicopters to provide air cover and extended surveillance for the surface action groups. But even without such facilities, the

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11/ The Navy, for planning purposes, assumes that the 15 carriers would be deployed in wartime in seven two-carrier battle groups, each containing 12 surface escorts plus one single-carrier battle group containing six surface escorts. Each battle group, either with one or two carriers, would be supported by an underway replenishment group. In addition, the logistics chain would require naval auxiliary or merchant ships to resupply the replenishment ships. It is assumed here that three additional carriers would be supported by two additional replenishment groups.

modified battleships could operate with the support of land-based aircraft, helicopters from accompanying destroyers and cruisers and, in the future, aircraft from large amphibious ships (LHA/LHD) that could support V/STOL or helicopter operations. The four proposed SAGs would require about 20 ships and, as in the case of carrier battle groups, their operations would require the support of underway replenishment ships.

Total surface combatant requirements, as seen by the Navy, are shown in Table 2. This represents the number of surface warships required to support 15 aircraft carriers, four surface action groups, the amphibious force, 10 underway replenishment groups, and seven convoys.

TABLE 2. NAVY OBJECTIVE FOR SURFACE COMBATANT FORCE LEVEL a/

Force Types	BB	CGN	CG-47	DDG-51	DD-993	DD-963	FF/FFG
15 Carrier Battle Groups	--	6	23	31	--	30	--
4 Surface Action Groups	4	--	4	12	--	--	--
Amphibious Force (1.5 MAF) b/	--	--	--	10	4	--	8
10 Underway Replenishment Groups	--	--	--	10	--	--	30
7 Convoys	--	--	--	--	--	7	63
Total	4	6	27	63	4	37	101

a/ See glossary in Table 1 for identification of ship type for each designation; for example, CG is a cruiser.

b/ A MAF is a Marine Amphibious Force consisting of about 32,500 troops.

Attack Submarines

Many observers believe that submarines would be the warships most likely to prove decisive in future naval combat. The Navy now has a force of 91 attack submarines of which all but five are nuclear powered. 12/ They would be used in wartime to conduct offensive operations against enemy submarines and shipping in forward areas, to form barriers at geographic choke points against the passage of enemy ships and submarines, and to operate in direct support of battle groups. Submarines might be used as well in various secondary missions such as minelaying in forward areas. The Navy believes that together all of these missions would require a force of more than 100 submarines in wartime. Until recently the Navy had a force level goal of 90 nuclear attack submarines. This has been increased recently to 100 submarines, but, pointing to the Soviet force of about 110 nuclear and 180 diesel attack submarines, the Navy regards even a 100-ship force goal as set more by budgetary than operational considerations. 13/

Amphibious Forces

Amphibious forces--that is, those forces capable of the forcible landing of troops from the sea--are regarded by the Navy as a key element of its power-projection capability. Given the current emphasis on the Rapid Deployment Force (RDF) and associated force projection capabilities in the national strategy, amphibious force capabilities assume particular importance.

12/ Attack submarines (designated SS--conventionally powered, or SSN--nuclear powered) are general purpose warships with a primary mission of defeating enemy submarines and surface warships. Ballistic missile submarines (SSBNs) are strategic force ships with a primary mission of launching nuclear ballistic missiles.

13/ Vice Admiral J. G. Williams, USN, Deputy Chief of Naval Operations (Submarine Warfare), stated that he believes a force of 131 nuclear-powered attack submarines would be more appropriate to the real military need. In Hearings on Military Posture and H.R. 2970, Part 3, p. 216.

The amphibious force contains several types of ships, all specifically designed to support the landing of troops onto a hostile shore. The Navy's current capability, considering both troop and equipment lift requirements, can lift about one notional Marine Amphibious Force (MAF). 14/

Current peacetime deployment requirements call for maintaining three Marine Amphibious Units (MAUs) continuously deployed, one in the Mediterranean and two in the Western Pacific, with a fourth intermittently deployed in the Caribbean or North Atlantic. With current amphibious ship force levels, however, only the Atlantic fleet can meet its requirement and both the Atlantic and Pacific fleets experience higher than desirable deployment ratios (ratio of time deployed to time in home port).

The Administration believes that the current amphibious lift capability should be substantially expanded to a level that would simultaneously support a MAB in addition to the current MAF. This would require a 50 percent increase in troop capacity over that required for a MAF alone and even larger increases in capacity for vehicles and cargo (see Table 3). Lift capacity would be increased both by adding to the number of ships in the amphibious force and by replacing retiring amphibious ships with new ships of larger capacity. Such an expansion would permit a simultaneous landing in force in two different areas or, of course, a landing with a substantially larger force in a single area.

Replenishment Ships

Navy planning currently considers a force of 69 replenishment ships to be the minimum needed to support a 15-carrier Navy. Table 4 shows the types of replenishment ships planned.

In underway replenishment, it is important to minimize the time a warship must spend alongside the replenishment ship. In the Navy's underway replenishment concept, warships in the battle

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14/ Three acronymns--MAF, MAB, and MAU--are commonly used to denote variously sized aggregates of amphibious troops and their equipment. A Marine Amphibious Force (MAF) consists of about 32,500 troops, a Marine Amphibious Brigade (MAB) has about 15,500 troops, and a Marine Amphibious Unit (MAU) has about 1,600 troops.

TABLE 3. AMPHIBIOUS LIFT REQUIREMENTS

Lift Requirement	Personnel	Vehicles (Sq. Ft. X 1,000)	Cargo (Cu. Ft. X 1,000)	Helicopters
MAF (Current)	35,880	778	2,045	512
MAB (Proposed Addition)	17,826	495	1,771	167
Total Requirement	53,706	1,273	3,816	679
Percent of one MAF Lift	150	164	187	133

SOURCE: Department of the Navy.

TABLE 4. REPLENISHMENT SHIPS: OBJECTIVES AND CURRENT FORCE

Ship Type	Objective	Current Force
Multiproduct Station Ships (AOE/AOR)	15	11
Oilers (AO/TAO)	29	19
Ammunition Ships (AE/TAE)	16	13
Refrigeration/Stores Ships (AFS/TAF)	9	10
Total	69	53

group would be resupplied by multiproduct "station ships," which would provide fuel, ammunition, and stores in a "one-stop" replenishment. 15/ The station ships would be resupplied by "shuttle ships"--oilers (AOs), ammunition ships (AEs), and stores ships (AFSs)--in the underway replenishment group. The shuttle ships, in turn, would be resupplied at advance bases with materials brought in by merchant ships.

Thus the Navy seeks to establish a logistics chain culminating in a rapid transfer of fuel, stores, and munitions to operating warships at sea. Since replenishment ships are absolutely essential for sustained operation at sea, loss of any link in the chain can result in loss of the logistics flow and, therefore, loss of the battle group's ability to sustain operations at sea. Any decision to expand the size of the battle fleet, therefore, requires a commensurate expansion of the mobile logistics support force.

Mine Warfare Forces

Although mine warfare is among the least glamorous of naval activities, it is also one of the most potent threats in the entire arsenal of naval weapons. Not only can mines destroy enemy merchant and naval ships at low cost to the nation deploying them, but the very threat of mines can paralyze large numbers of enemy ships. Mines used by an inferior naval power can greatly inhibit the use of the seas by a dominant naval power, and the dominant power can use mines to solidify its control efficiently over ocean areas against potential challengers. Mine warfare, therefore, deserves careful consideration in developing naval plans and programs.

The Soviet Union is not unaware of the effectiveness of mines and is known to have the world's largest stockpile of mine warfare weapons. The U.S. mine warfare fleet has dwindled from about 100 ships in the mid-1960s to the present level of 25 ships, almost all of which are over 25 years old, and all but three of which are assigned to the Naval Reserve. The Navy plans to improve capabil-

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15/ Station ships are designated as AOEs and AORs. AOEs are larger (53,000 tons vs. 37,000 tons) and faster (29 knots vs. 21 knots) than AORs.

ities in this long-neglected area by building at least 31 new mine countermeasure ships, designated MCM and MSH. The lead MCM was authorized in fiscal year 1982.

Summary of Navy Force Goals

The Navy believes that the fleet described above and outlined in Table 5 is the minimum force necessary to protect U.S. interests at sea, given currently foreseen conditions. It features 15 deployable aircraft carriers, with their associated air wings and battle group escorts, forming the primary offensive strike forces. These 15 battle groups, together with the four surface action groups (SAGs), 100 nuclear attack submarines, and

TABLE 5. NAVAL FORCE OBJECTIVES

Ship Type	Number of Ships	
	Objective	Current Force
Aircraft Carriers	15	12
Battleships	4	0
Battle Group Escorts	137	112
Frigates	101	81
Attack Submarines	100	91
Small Combatants	--	5
Total, Combatants	357	301
Amphibious Ships	75 (1.5 MAF)	65 (1.0 MAF)
Mine Warfare Ships	31	25
Replenishment Ships	69	53
Material Support Ships	27	26
Fleet Support Ships	33	30
Total, Other Types	235	199
Strategic Force (SSBNs)	Unstated	35
Total Ships	600+	535

1.5 MAF amphibious force, would provide both a larger Navy, better able to sustain the extensive deployment commitments now taxing the current forces, and a Navy with enhanced combat capabilities, better able to conduct wartime tasks.

The previous Administration had many of the same basic goals for the Navy, that is: improving fleet readiness, air defense capabilities, and antisubmarine warfare capabilities; maintaining forces for worldwide presence and crisis management; strengthening offensive striking power; and upgrading mine warfare posture. Force level goals were more modest, however: 12 deployable aircraft carriers, 90 nuclear attack submarines, amphibious lift for one MAF, and lower force goals in most other categories. The types of ships proposed by the current Administration are essentially the same as those of the previous Administration; the major difference is the size of the fleet.

THE FUTURE NAVY--WHAT IS NEEDED?

Current Navy strategy places primary emphasis on the carrier battle group as the basis of naval power. In the event of a full-scale war between the United States and the Soviet Union, battle groups would be the primary offensive striking arm for conducting a frontal assault against Soviet naval forces and bases. This mission, however, is by no means the only one that the Navy might be called upon to execute in the future. Depending upon the circumstances, the United States might find it advisable (because of the nature of the crisis, the disposition of Soviet forces, agreements made with allied nations, and so forth) to pursue some strategy other than a frontal assault on Soviet home bases. The Navy might face a distributed threat by Soviet and/or other naval forces that would require a different mix of ships, including a sufficient number of surface combatants to protect U.S. interests over a relatively long period in distant waters. Indeed, recent events in the Middle East have been of this nature, straining the Navy's resources with demands for additional continuous deployments.

In addition, some have questioned whether an approaching carrier battle group, with its enormous concentration of power, might induce the Soviet Union to use nuclear weapons against it. Certainly the temptation would be great, given the difficulty of defeating a battle group with conventional weapons. In addition, use of nuclear weapons at sea would involve minimal collateral damage; it would, therefore, be a clear-cut tactical use exclusively against military forces.

Even if one takes the most pessimistic view of the prospects for using carrier battle groups to attack Soviet bases, the need for aircraft carriers and their associated escort and support forces does not necessarily collapse, although the strategy for their employment might change. If the Navy was prevented from making a frontal assault on enemy naval forces in their basing areas because of concern about nuclear escalation--or for any other reason--then the strategy of winning through quick destruction of the enemy's naval forces and supporting base structure might have to be revised. In such a situation, a more gradual attrition of enemy forces and a wider distribution of naval forces might be necessary. In this kind of war, or in a war focused in some area of the Third World, a massive, coordinated attack such as the Soviet Union could organize near its home waters might not materialize, but the U.S. Navy could be faced with the task of opposing Soviet naval forces worldwide. In such circumstances, having ships with sufficient capability to withstand the maximum Soviet home-water threat might be less important than having enough ships to oppose a distributed threat in distant waters. 16/

16/ For a discussion of alternatives for naval mission priorities, see Congressional Budget Office, Shaping the General Purpose Navy of the Eighties: Issues for Fiscal Years 1981-1985 (January 1980), Chapter II.

CHAPTER III. BUILDING THE FUTURE NAVY--ALTERNATIVE APPROACHES

The Navy has described in fairly precise terms the kind of fleet it believes is needed, but, even within the context of that goal, there can be many different programs, depending upon how quickly and in what sequence the required ships are built. Future shipbuilding programs, however, may be constrained by budgetary limits. This has, in fact, been the prevailing reality in the past. Out-year shipbuilding plans have almost always been scaled down to fit within budgetary limitations.

If the fleet recommended by the Navy is accepted as the goal, it is clearly desirable to get the required ships at sea as soon as possible. Building up the fleet rapidly would be expensive, however. Budgetary and industrial limitations might necessitate a slower expansion. If even an extended buildup proved infeasible because of cost, then the force objectives might have to be modified. This could be done by reducing the number of ships in the shipbuilding program or by modifying the mix of ships contained within that program.

If the Navy determined to increase the fleet size but fell considerably short of its goal because of the high cost of the ships procured, this could affect significantly the strategy options available in a future conflict. An offensive strategy might still be possible with a smaller fleet of highly capable ships, if the force was properly massed, skillfully used, and not destroyed by nuclear counterattacks. If, however, the nature of the conflict called for extended operations in distant areas against a distributed threat, then a numerically smaller fleet might be hard pressed to prevail.

The Congress should consider carefully the longer-term budgetary implications of the Navy's shipbuilding program and assess whether the Navy's strategy--and the shipbuilding program derived from that strategy--is the best basis on which to proceed with naval modernization. In order to begin such an assessment, there must be some estimate of the longer-term budgetary costs of the Navy's program and of some possible alternative programs. That is the objective of this chapter. Later, in Chapter V, the implications for the total Navy budget, including manpower and support costs as well as procurement, will be examined.

This chapter presents four options illustrating the budgetary and force structure effects of using different approaches to future shipbuilding programs. The options are designed to illuminate major program and budgetary implications of representative future naval shipbuilding alternatives. None of the options were designed to match the specific details of the Administration's current five-year program. The Administration program is discussed in Chapter VI.

OVERVIEW OF OPTIONS FOR NAVAL SHIPBUILDING PROGRAMS

Of the four options examined, two--Options I and II--would achieve the number and types of ships recommended by the Navy, with Option I reaching the goal more quickly than Option II. Option III would limit costs by procuring fewer ships of the kinds contained in current Navy plans. It would result in a substantially smaller fleet than Options I and II. Option III illustrates what would probably happen if the United States embarked upon the Navy's plan, but the funding in future years fell short of the amount needed to complete the program. Option IV introduces some ship types not contained in current Navy plans. It would reach the Navy's numerical force level goals, but do so at a substantially lower cost than Options I or II. Option IV illustrates the kind of program that might be pursued if it was decided to emphasize a distributed-force, open-ocean capability as opposed to a concentrated carrier battle group offensive strategy.

Option I would achieve the Navy's force goals for types and numbers of ships and have these ships at sea by 1992. This time frame generally agrees with the goal stated by the Secretary of the Navy and is probably about the shortest industrially feasible time for accomplishing that goal. (For ships to be commissioned by 1992, CBO assumed that they would have to be authorized no later than 1988.)

Option I would require an annual budget for Shipbuilding and Conversion, Navy (SCN) averaging $24.8 billion through 1988. 1/ That is a very high level--about 2 1/2 times the

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1/ Funds for building Navy ships are appropriated in the budget category "Shipbuilding and Conversion, Navy" (SCN). The amount of this appropriation intended for new construction

shipbuilding budget in fiscal year 1982 (in fiscal year 1983 dollars).

Option II also would reach the Navy's force goals, but extend the period of time for building the required ships. In this option, rather than having the ships in the fleet in ten years, CBO assumed that the required ships would be authorized over a ten-year period ending in 1992. This means that all the ships would not enter the fleet until about 1996. Option II would require construction of more ships than Option I to compensate for the additional ships retired by the Navy during the longer duration of this option. Funding for Option II would average $21.3 billion (in fiscal year 1983 dollars) annually through 1992, providing only slight budgetary relief from the high levels of Option I.

Since Options I and II both would result in shipbuilding and conversion budgets considerably higher than previous authorizations, Option III is presented to illustrate the force levels that might be achieved by 1996 if annual budgets were limited to levels about 25 percent above the level authorized in 1982 in fiscal year 1983 dollars. In Option III, it is assumed that the mix of ship types procured would be similar to those in current Navy plans, but the force levels would be lower, generally comparable to those planned during the Carter Administration.

Option IV would reach the higher force level goals advocated by the Navy but with a somewhat different mix of ships among the combatant types than in Options I and II. The annual cost of about $15.1 billion, though higher than Option III, would be considerably lower than Options I and II.

Figure 1 shows the budget trends for shipbuilding and conversion, for each of the four options.

OPTION I: RAPID BUILDUP TO NAVY FORCE OBJECTIVES

Option I illustrates the program and budgetary implications of building naval forces conforming in numbers and types of ships to the goals presented to the Congress by the Navy in testimony

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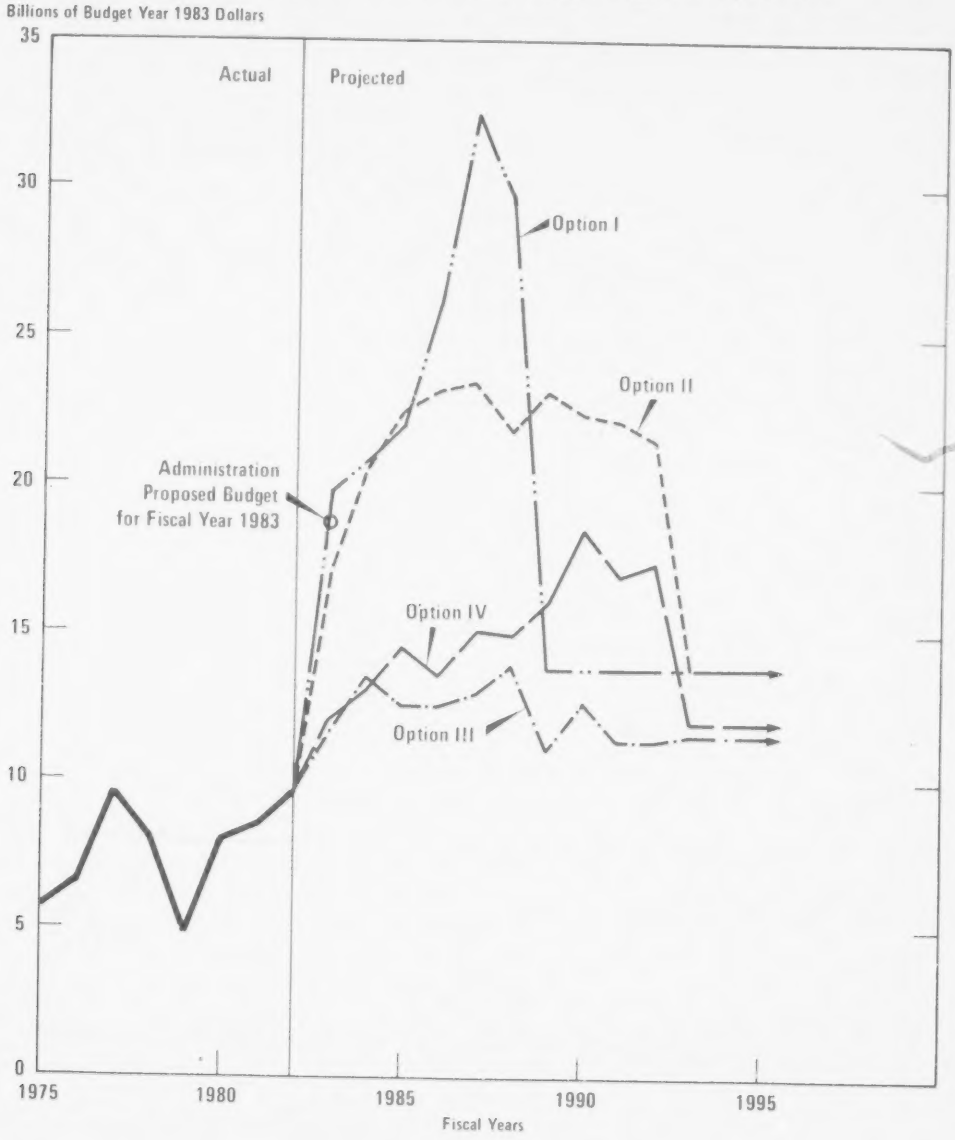
varies from year to year but has averaged about 80 percent over the past 10 years. The other 20 percent is spent on other items, including ship conversions.

Figure 1.

Shipbuilding and Conversion, Navy Budget Levels Since 1975 and Projected to 1995 Under Four Shipbuilding Program Options



during the spring of 1981. 2/ It would achieve these force goals with nearly all of the required ships in the fleet within ten years. This period is about the shortest time in which the required ships could be built and is in general agreement with the Secretary of the Navy's often stated goal of achieving a 600-ship Navy by the end of this decade. Indeed, Option I results in over 600 ships at sea by 1989. A force with the specific types of ships that conform to current Navy force structure goals is not achieved, however, until 1992.

In developing the force structure projections for Option I and for all subsequent options, CBO assumed that the ships currently in the fleet would be retained for at least a service life of 30 years. A service life of 50 years is assumed for aircraft carriers and 40 years for certain classes of auxiliary ships that are now frequently retained beyond 30 years. CBO assumed that ships would be delivered to the Navy four years after authorization, except for aircraft carriers which require eight years to build; Trident submarines, six years; nuclear-powered cruisers, five years; and nuclear-powered attack submarines, five years. Given these assumptions, new ships would have to be authorized no later than 1988 to be in the fleet by 1992.

Using these assumptions and the Navy's force objectives as shown in Table 5 in Chapter II, CBO developed a shipbuilding program through 1988 that would achieve the required force structure by about 1992. Details of this building program and a year-by-year breakdown of the resulting force structure are contained in Appendix A. The results are summarized in Tables 6 and 7.

This option would require authorization of a total of 176 ships over a period of six years at a total cost of $119 billion. Major items include three aircraft carriers at $3.5 billion each, six Trident submarines at $1.4 billion each, nine SSN-688-class submarines at $700 million per ship, and 61 cruisers and destroyers for a total surface combatant cost of about $64 billion. This amount, however, is only for construction of new ships (and reactivation of the four battleships). The Navy shipbuilding budget contains other items, such as conversions, outfitting,

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2/ See Hearings on Military Posture and H.R. 2970, Part 3, pp. 441-75.

TABLE 6. OPTION I: RAPID BUILDUP TO NAVY FORCE OBJECTIVES--SHIPS IN FLEET BY 1992 AND AUTHORIZED BY 1988 (Dollar amounts in fiscal year 1983 dollars)

Current Force (End of 1981)	535
Retirements Through 1992	152
Now Building or Authorized	98
New Authority Through 1988	176
Fleet Total, 1992	657

Six-Year Program: 176 ships costing $119 billion

Average Annual Program: 29.3 ships costing $19.8 billion

Average Annual SCN a/ Requirement: $24.8 billion

a/ SCN = Shipbuilding and Conversion, Navy. It is assumed that new construction accounts for 80 percent of the total SCN appropriation.

TABLE 7. OPTION I: RAPID BUILDUP TO NAVY FORCE OBJECTIVES--ILLUSTRATIVE SHIPBUILDING PROGRAM

Ship Type	Number of Ships	Percent of Total Cost
Trident Submarines	6	7
Aircraft Carriers	3	9
Surface Combatants	64	55
Attack Submarines	9	5
Amphibious Ships	17	8
Mine Warfare Ships	30	2
Replenishment Ships	29	9
Material Support Ships	13	5
Fleet Support Ships	5	less than 1
Total	176	

post delivery costs, cost growth, and unforeseen escalation. These items have averaged about 20 percent of the budget over the past 10 years. 3/ Assuming a 20 percent allowance for these other items, the resulting average annual cost would be $24.8 billion, considerably higher than any previous peacetime shipbuilding budget. The fiscal year 1982 shipbuilding authorization was $8.8 billion, or about $9.6 billion in fiscal year 1983 dollars. The Administration's 1983 request is for $18.6 billion for shipbuilding.

A summary breakdown of the six-year shipbuilding program is displayed in Table 7. It contains three new carriers necessary to build to 15 battle groups and other ships required to reach Navy force level goals. Clearly the dominant budget item is surface combatants, which claim over half of the total new construction budget. This is because of the large number of battle group surface combatants needed to replace those now approaching retirement and to build up to the higher force level goals, and the high cost of the current AEGIS and AEGIS-derivative ships proposed to replace them. 4/

This option is the most desirable in terms of the Navy's currently stated objectives. It would attain the Navy's force goals and do so in a shorter period of time--by 1992--than any of the other options. It would produce a fleet structured to support the Navy's current offensive strategy (discussed in Chapter III), including 15 deployable aircraft carriers and their associated highly capable escort ships.

The cost of Option I would be very high, however. It would require a drastic and immediate increase in the shipbuilding budget. These high budgetary costs might be relieved somewhat by extending the time taken to achieve the Navy's force goals. This alternative is investigated in Option II.

3/ Funds for constructing Navy ships are contained in the Shipbuilding and Conversion, Navy appropriation. See footnote 1 of this chapter.

4/ AEGIS is the name of a large shipboard anti-air warfare system about to be deployed by the Navy. It has been in development since the late 1960s and will enter service for the first time on U.S.S. Ticonderoga (CG-47), scheduled for commissioning in 1983.

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OPTION II: MODERATELY PACED BUILDUP TO NAVY FORCE OBJECTIVES

Option II would attain the same Navy force goals as Option I, but extend the time to accomplish them. In Option II, CBO assumed that new ship authorizations required to achieve the force goals would be spread over a ten-year period ending in 1992, with ship deliveries substantially completed by 1996.

Since this option would extend over a longer period during which more older ships would be retired, more new ships would have to be authorized than in Option I. Using the same retirement criteria and building time assumptions as in Option I, an illustrative shipbuilding program was developed for this option. Details of the shipbuilding program and the year-by-year breakdown of the resulting force structure are contained in Appendix B. The results are summarized in Tables 8 and 9.

A total of 230 ships would have to be authorized over a period of ten years in this option at a total cost of $170 billion. This would require an average annual expenditure for new construction of $17.0 billion, somewhat less than in Option I, but spread over ten years rather than six. Moreover, the annual budget requirements would still be substantially higher than previous norms. Assuming again an allowance of 20 percent of the total SCN budget for items other than new construction, the total budget requirement would average about $21.3 billion per year over the ten-year period.

In the summary breakdown given in Table 9, surface combatants still dominate in terms of their share of costs. As in Option I, this occurs because of the large number of ships required and the high cost of the AEGIS/AEGIS-derivative ships now being procured or developed. Surface combatants procured under this option include 20 CG-47-class cruisers at $1.14 billion per ship, 42 DDGX destroyers at $800 million per ship, and 16 nuclear cruisers (CGN) at $1.75 billion per ship.

Option II would reach the same force goals as Option I, that is, a force consistent with the Navy's offensive strategy and with the Navy's currently stated requirements. These goals are achieved, however, four years later than in Option I. The average annual budget requirement for Option II would be reduced by about 16 percent from Option I, but would remain high--still over twice

TABLE 8. OPTION II: MODERATELY PACED BUILDUP TO NAVY FORCE OBJECTIVES--SHIPS IN FLEET BY 1996 AND AUTHORIZED BY 1992 (Dollar amounts in fiscal year 1983 dollars)

Current Force (End of 1981)	535
Retirements Through 1996	240
Now Building or Authorized	98
New Authority Through 1992	230
Fleet Total, 1996	623

Ten-Year Program: 230 ships costing $170 billion

Average Annual Program: 23 ships costing $17.0 billion

Average Annual SCN a/ Requirement: $21.3 billion

a/ Shipbuilding and Conversion, Navy. It is assumed that new construction accounts for 80 percent of the SCN appropriation.

TABLE 9. OPTION II: MODERATELY PACED BUILDUP TO NAVY FORCE OBJECTIVES--ILLUSTRATIVE SHIPBUILDING PROGRAM

Ship Type	Number of Ships	Percent Total Cost
Trident Submarines	10	8
Aircraft Carriers	5	10
Surface Combatants	87	53
Attack Submarines	16	7
Amphibious Ships	26	9
Mine Warfare Ships	30	2
Replenishment Ships	38	8
Material Support Ships	13	3
Fleet Support Ships	5	less than 1
Total	230	

the amount appropriated in fiscal year 1982. 5/ Alternatives with more modest budget requirements might, therefore, be of interest. One approach to lower budget costs--reducing the number of ships procured--is discussed in Option III.

OPTION III: BUDGET CONSTRAINED PROGRAM

Option III illustrates the force levels that would probably be achieved if the Navy procured the same types of ships as currently planned, but with a shipbuilding budget constrained to modest growth. In Option III, CBO assumed that the shipbuilding budget was constrained to a level averaging about $9.7 billion per year for new construction--which would correspond to an overall $12.1 billion SCN budget (in fiscal year 1983 dollars), again assuming new construction accounts for 80 percent of the SCN budget.

Under the assumptions discussed above, nearly all of the increased force level goals would have to be abandoned. The ships that could be procured within these limits would be sufficient only to replace ships being retired and maintain current force levels. Details of the illustrative shipbuilding program for this option and the resulting year-by-year force structure breakdown are contained in Appendix C. The results are summarized in Tables 10 and 11.

A Navy constrained to modestly increased budget levels and currently programmed ship types would closely resemble that planned by the Carter Administration: 12 deployable aircraft carrier battle groups, 90 nuclear attack submarines, amphibious lift for 1 Marine Amphibious Force (MAF), and current levels for most other ship types. The budget assumed for this option is not overly austere; indeed, it is higher than any SCN budget in the

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5/ The careful reader will observe that if Options I and II are considered over the same time period, fiscal years 1983 through 1996, the average budget requirement would be about the same. Both options would result in the same force structure but Option I would reach it in 1992 rather than 1996. Unless force goals were revised, subsequent construction would be only that required to maintain the status quo. Thus, in 1996 force levels under Options I and II would be identical, but Option I had funding accelerated in the early years.

TABLE 10. OPTION III: BUDGET CONSTRAINED PROGRAM--SHIPS IN FLEET BY 1996 AND AUTHORIZED BY 1992 (Dollar Amounts in Fiscal Year 1983 Dollars)

Current Force (End of 1981)	535
Retirements Through 1996	240
Now Building or Authorized	98
New Authority Through 1992	146
Fleet Total, 1996	539

Ten-Year Program: 146 Ships Costing $98 billion

Average Annual Program: 14.6 ships costing $9.7 billion

Average Annual SCN a/ Requirement: $12.1 billion

a/ Shipbuilding and Conversion, Navy. It is assumed that new construction accounts for 80% of the SCN appropriation.

TABLE 11. OPTION III: BUDGET CONSTRAINED PROGRAM--ILLUSTRATIVE SHIPBUILDING PROGRAM

Ship Type	Number of Ships	Percent of Total Cost
Trident Submarines	10	14
Aircraft Carriers	0	0
Surface Combatants	62	57
Attack Submarines	6	4
Amphibious Ships	16	11
Minewarfare Ships	24	2
Replenishment Ships	20	7
Material Support Ships	8	4
Fleet Support Ships	0	0
Total	146	

past decade. The relatively low force levels would primarily occur because of the very high cost of the types of ships, now being procured by the Navy, particularly the combatants. Although this option would result in force levels considerably below the Navy's current plans, it would require that recent SCN budget levels be not only maintained but be increased to a level about 25 percent higher on average, in the future.

This option would retain the Administration's recent initiative for reactivating the four Iowa-class battleships. Four surface action groups formed around these impressive ships could be used to supplement the present 12 carrier battle groups in maintaining deployment commitments around the world. Instead of deploying two aircraft carrier battle groups in the Indian Ocean, for example, one carrier group and one surface action group might be deployed there. When upgraded with cruise missiles and improved helicopter-V/STOL aviation capability, a U.S. battleship surface action group would probably be superior to any current Soviet battle group. Use of the battleships in this way could relieve some of the operating pressures on U.S. carrier forces.

Clearly an option that provides higher force levels, but without the very high budget requirements of Options I and II, would be desirable. This alternative is discussed in Option IV.

OPTION IV: EXPANDED NAVY OF MODIFIED FORCE MIX

Option IV investigates the feasibility of achieving higher ship force levels at a lower cost by altering the mix of ships procured. The shipbuilding program of Option IV resembles that of Option II, except that several alternative warship types would be substituted for those currently planned by the Navy. This would result in force levels very close to the goals established by the Navy, but at an average annual SCN budget estimated at about $15.1 billion (in fiscal year 1983 dollars), compared to $24.8 billion for Option I and $21.3 billion for Option II. Shipbuilding budgets of this magnitude, though significantly higher than in the past, might be achievable--if the Administration's plans for substantial real growth in defense spending are realized.

Alternative Ship Types

In seeking ways to reduce shipbuilding program costs, attention is immediately drawn to the surface combatants, since that

category accounts for more than half of the total program costs in each of the three previous options. One of the most significant items in the surface combatant category is the guided missile destroyer (DDG). A large number of this type of ship is needed to provide modern air defense protection to the fleet and to replace the many existing DDGs that will be retired by 1996. The Navy is currently designing a ship, designated DDG-51 (previously DDGX), to fill this role. The DDG-51 would be a capable anti-air warfare (AAW) ship, but its cost has risen steadily during design development and is now estimated at about $800 million per ship. The previous three options all assumed procurement of DDG-51 for the guided missile destroyer role.

In Option IV, it is assumed that the DDGY, a substantially less expensive guided missile destroyer, costing about $400 million per ship, would be procured. 6/ The cost estimate for this ship is based upon the cost for the FFG-7-class guided missile frigate now being built, with additions for upgraded combat system and ship performance features. The DDGY would not have a powerful AEGIS or AEGIS-derivative phased-array radar as does the DDG-51, but it would have a modern AAW missile fire control system incorporating an advanced technology terminal engagement radar (TER). This and other features described in the CBO report cited in footnote 6 would make the DDGY a very capable warship. There is no current program to develop a ship of this kind, however. Such a program would, of course, involve some technical risks and as much as $300 million in research and development (R&D) expenditures. Availability of a ship like DDGY could substantially reduce long-term shipbuilding program costs for surface combatants.

In Option IV aircraft carriers would be procured at the rate of one every three years, as opposed to one every other year in Options I and II. This would place 14 deployable carriers in the fleet in 1996 rather than 15. Fleet aviation capability is supplemented in this option, however, by building twelve cruisers (CGV) with extensive facilities for supporting V/STOL aircraft. These cruisers would operate with surface action groups and underway replenishment groups, as well as in other areas in which carrier-based aircraft are not available.

6/ This ship is discussed in Congressional Budget Office, Naval Surface Combatants in the 1990s: Prospects and Possibilities (April 1981).

Option IV would retain the Navy's new goal of 100 attack submarines but procure updated diesel-electric submarines to provide for the growth from the previous goal of 90 submarines. Though not as effective as nuclear submarines over the full spectrum of missions, diesel-electric submarines can perform quite well in some very important missions, such as barrier patrols. 7/ The most attractive feature of diesel-electric submarines is their low cost in comparison to nuclear-powered ships. Thus, more diesel-electric submarines could be procured for any given investment level. A German shipbuilding firm, Howaldtswerke-Deutsche Werft, has formally offered to design and build a fully equipped diesel-electric submarine of 2,600 tons submerged displacement for the U.S. Navy for $218 million (in fiscal year 1981 dollars). This price includes a capable modern combat system of U.S. manufactured components. The firm estimates that follow-on ships would be about half that price. Nuclear attack submarines funded in fiscal year 1981 cost $457 million each and are estimated to cost $700 million in fiscal year 1983. A mixed force of nuclear and diesel submarines, with nuclear submarines undertaking the more demanding missions, would permit the United States to maintain a force of 100 submarines at lower cost or, alternatively, to maintain a still larger number of submarines at the same cost as an all nuclear force.

Shipbuilding Program

An illustrative shipbuilding program incorporating the force mix changes described above is presented in detail in Appendix D, along with the resulting year-by-year force structure breakdown. The results are summarized in Tables 12 and 13.

Option IV would produce an expanded Navy with force levels comparable to Navy objectives but at a cost substantially lower than Options I and II. It would result in a fleet of 624 ships in 1996, but with the different mix of ships discussed above. The average annual budget requirement of $15.1 billion (in fiscal year 1983 dollars), though less than the $24.8 billion and

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7/ For a further discussion of diesel-electric submarines in modern naval warfare, see Congressional Budget Office, Shaping the General Purpose Navy of the Eighties: Issues for Fiscal Years 1981-1985 (January 1980), pp. 93-96 and Appendix B, pp. 127-40.

TABLE 12. OPTION IV: EXPANDED NAVY OF MODIFIED FORCE MIX--SHIPS IN FLEET BY 1996 AND AUTHORIZED BY 1992 (Dollar amounts in fiscal year 1983 dollars)

Current Force (End of 1981)	535
Retirements Through 1996	240
Now Building or Authorized	98
New Authority Through 1992	231
Fleet Total, 1996	624

Ten-Year Program: 231 ships costing $121 billion

Average Annual Program: 23.1 ships costing $12.1 billion

Average Annual SCN a/ Requirement: $15.1 billion

a/ Shipbuilding and Conversion, Navy. It is assumed that new construction accounts for 80 percent of the SCN appropriation.

TABLE 13. OPTION IV: EXPANDED NAVY OF MODIFIED FORCE MIX--ILLUSTRATIVE SHIPBUILDING PROGRAM

Ship Type	Number of Ships	Percent of Total Cost
Trident Submarines	10	12
Aircraft Carriers	3	9
Surface Combatants	90	42
Attack Submarines	16	5
Amphibious Ships	26	14
Mine Warfare Ships	30	3
Replenishment Ships	38	11
Material Support Ships	13	5
Fleet Support Ships	5	less than 1
Total	231	

$21.3 billion of Options I and II, respectively, is still substantially higher than previous norms. (The fiscal year 1982 SCN authorization was $8.8 billion, or about $9.6 billion in fiscal year 1983 dollars.) Funding the program of Option IV would require substantial real growth in SCN budget authority of about 8 percent per year over the ten-year period. This is clearly more than the 7 percent annual real growth over five years projected by the Administration for overall defense spending, but is less drastic than the budget acceleration required for Options I or II. CBO's analysis, therefore, suggests that budget growth in SCN beyond that projected for defense as a whole will almost certainly be required if any significant naval force expansion is to be realized.

The fleet resulting from Option IV would not be simply a less expensive program than Options I and II. It would also be structured in accordance with a somewhat different view of naval warfare. Although it would possess much better offensive strike capability than today's fleet, the fleet of Option IV would be oriented more toward broad-ocean, distributed-force operations as opposed to concentrated battle group strikes. Although this force would contain 14 large aircraft carriers and the ships to support them, it would be less optimized for offensive strike operations than the forces of the previous options in the interest of obtaining more ships, such as the CGV and the DDGY, that are well-suited to worldwide operations against a distributed threat. This fleet structure would be consistent with the view, described in the preceding chapters, that the ability to control and defend large areas of the ocean is likely to be at least as important a capability for U.S. naval forces in the future as the ability to mount a frontal assault by battle groups in enemy waters.

Four Program Options--Recapitulation and Conclusions

Consideration of the four program options discussed above suggests some important conclusions regarding the Navy's current force expansion plans. Options I and II indicate that expanding to the force levels proposed by the Navy with the kinds of ships currently programmed could not be accomplished without increasing shipbuilding budgets to levels well above previous peacetime budgets and well above levels that would be reached with 7 percent annual real growth. Option III indicates that, if the Navy continued to procure the kinds of ships currently programmed and if shipbuilding budgets did not grow substantially above current levels, the Navy of the 1990s would be essentially that projected by the previous Administration. Attainment of the currently

stated force goals within the bounds of the current Administration's planned real growth in budget authority would be achieved only if successful efforts could be mounted to develop less costly warships, such as those suggested in Option IV.

CHAPTER IV. INDUSTRY AND NAVAL FORCE EXPANSION

Any discussion of a sustained increase in a major defense program, like the naval force expansion, should include consideration of the industrial base necessary to support such a program. This chapter provides a summary description of the industrial conditions relating to warship construction in the United States and an assessment of the feasibility, from an industrial standpoint, of the options presented in Chapter III. 1/

CBO concludes that there is adequate shipbuilding capacity in the United States to support any of the four options considered in this report. In fact, given the present severely depressed commercial ship market and the bleak prospects for near-term improvement, an expanded naval ship construction program might be the best means of preventing a serious deterioration of the industrial base supporting the Navy.

Modern warships, however, are not built by shipyards alone. The shipyards are supported by a host of other contractors who supply everything from raw materials to complex electronic systems. Indeed, in the case of the more complex modern warships, only about 40 percent of the total cost goes to shipyards, with the balance spent to procure the combat system components (missile systems, radars, sonars, and so forth) and for other equipment and program support functions. Problems that could govern ship delivery schedules could also arise in these supporting industries. No such problems are now evident, however, largely because of excess capacity in the economy as a whole. Potential future problems in these supporting industries, while not the focus of this chapter, might be averted by a sustained commitment to higher production rates.

1/ This assessment draws heavily upon the results of a study of the U.S. and Soviet shipbuilding industries prepared by the Department of Defense at the request of the Senate Armed Services Committee. See R.E. Kuenne, et al., The Shipbuilding Industries of the U.S. and U.S.S.R. as Bases for National Maritime Policies: Current Capabilities and Surge Demand Potential, IDA Report R-260 (Arlington, Virginia: Institute for Defense Analyses, February 1981).

THE U.S. SHIPBUILDING INDUSTRY

The U.S. shipbuilding industry enjoys a long and proud tradition dating from early colonial days. It provided the merchant hulls, from clippers to containerships, that carried the waterborne commerce of a maritime nation through two centuries of unparalleled economic growth. American shipyards also produced the warships that protected this commerce and U.S. interests around the world. Now this industry is in trouble. It is widely agreed that the shipbuilding industry (or more precisely that segment producing ocean-going ships) is uneconomic and would almost disappear if it were not for the protection and subsidies it receives as a result of national maritime policy. This is primarily a result of fundamental economic realities, and is a plight shared by the shipbuilding industries in many other industrially mature nations.

The Shipbuilding Process

The shipbuilding process resists the industrial innovations that have been so successful in other industries. Ships cannot be mass-produced because of low unit demand. While automobiles of a given type are produced by the hundreds of thousands and airplanes by the hundreds, it is unusual for production of a given ship design to extend beyond ten units. Ships, therefore, are a tailor-made product, produced by skilled craftsmen without the aid of the labor-saving production-line techniques that higher volume production might justify. This does not mean that the industry has been devoid of technical improvements. Impressive advances have been made, including greatly improved welding methods, numerically controlled cutting and machining techniques, modular construction methods, semiautomatic assembly of piping and structural members, and computer-based control methods, to name only a few. Nevertheless the nature of the product and the inherent low unit volume make shipbuilding a labor-intensive process. This is demonstrated by the low value of shipments per employee relative to other industries shown in Table 14.

Current Status of U.S. Shipyards

Although there are over 400 firms engaged in some aspect of shipbuilding and repair in the United States, most of these are quite small and the private shipyards relevant to naval industrial planning number only about 26. These can be further narrowed to only nine that are currently capable of warship construction. Of the rest, the Navy considers six capable of building amphibious

TABLE 14. REAL VALUE OF SHIPMENTS PER EMPLOYEE, 1972-1976 (In 1976 dollars)

Industry	1972	1973	1974	1975	1976
Shipbuilding	17,302	20,060	24,886	33,270	31,030
Automobiles	94,529	99,237	98,600	126,001	173,333
Aircraft	28,872	34,408	40,754	54,681	60,664

SOURCE: R.E. Kuenne, et al., The Shipbuilding Industries of the U.S. and U.S.S.R. as Bases for National Maritime Policies: Current Capabilities and Surge Demand Potential, IDA Report R-260 (Arlington, Virginia: Institute for Defense Analyses, February 1981), p. S-18.

and auxiliary ships and eleven others capable of building seagoing merchant ships. These are listed in Table 15.

In addition, the Navy itself maintains eight shipyards, four on the east coast, three on the west coast, and one in Hawaii. These are very important to maintaining the fleet as they are all major industrial activities fully capable of dealing with the complexities of modern warships. Although the naval shipyards have built ships throughout most of their long history, since the late 1960s all new ships have been constructed in private shipyards, with the naval shipyards devoting their efforts to overhaul and repair.

Another important distinction among shipyards with regard to Navy support is the capability to work with nuclear reactors. Currently two private shipyards (General Dynamics, Groton, Connecticut, and Newport News Shipbuilding & Drydock Co., Newport News, Virginia) and six naval shipyards (Portsmouth, Norfolk, Charleston, Puget Sound, Mare Island, and Pearl Harbor) are qualified to work on nuclear-powered ships.

This shipbuilding base should be adequate to support any but the most extraordinary industrial support needs of the Navy. The key industrial problem is to keep the U.S. shipbuilding industry from collapsing owing to a lapse in demand for its product. Compared to 1972 and 1973, when new contracts for 48 and

TABLE 15. MAJOR U.S. SHIPBUILDING YARDS, BY REGION, DECEMBER 1980

	Total Plant Employees	Total Production Workers	Building Category a/
Total Active Shipbuilding Base	119,109	98,000	---
Atlantic Coast	66,501	55,687	---
Bath Iron Works	5,584	4,969	I
General Dynamics, Quincy	3,740	2,294	I
General Dynamics, Groton	24,738	21,365	I
Bethlehem Steel, Sparrows Pt.	2,720	1,523	II
Maryland Shipbuilding and Drydock	1,806	1,168	II
Newport News Shipbuilding and Drydock	24,208	18,713	I
Norfolk Shipbuilding and Drydock	3,705	2,513	III
Gulf Coast	28,635	22,819	---
Tampa Ship Repair & Drydock	700	406	III
Alabama Drydock & Shipbuilding	1,249	945	III
Litton/Ingalls, Pascagoula	11,926	9,638	I
Avondale Shipyards	7,723	6,124	I
Halter Marine Services	2,507	2,074	II
Equitable Shipyards	1,110	800	III
Levingston Shipbuilding, Orange	2,237	1,812	III
Todd Shipyards, Houston	489	441	III
Todd Shipyards, Galveston	694	579	III
Pacific Coast	19,681	15,864	---
National Steel & Shipbuilding	7,528	5,837	II
Todd Shipyards, San Pedro	3,789	3,228	I
Bethlehem Steel, San Francisco	580	328	III
Tacoma Boatbuilding Company	2,057	1,533	II
Todd Shipyards, Seattle	4,167	3,607	I
Lockheed Shipbuilding, Seattle	1,560	1,331	I
Great Lakes	4,292	3,630	---
American Ship Building, Lorain	1,096	896	III
Peterson Builders, Inc.	974	884	III
Bay Shipbuilding, Sturgeon	1,358	1,111	III
Marinette Marine Corp.	864	739	II

SOURCE: Department of the Navy, U.S. Maritime Administration, Institute for Defense Analyses.

a/ I = Combat capable (plus amphibious/auxiliary and merchant);
II = Amphibious/auxiliary capable (plus merchant); and
III = Merchant capable (only).

43 merchant ships of 1,000 gross tons and over, respectively, were placed with U.S. shipbuilders, only seven vessels were ordered in 1980 and six in 1981. As of December 31, 1981, the orders for merchant shipbuilding for all U.S. shipyards totaled only 33 ships with a total displacement of 705,000 gross tons. As of the end of 1981, the backlog of 98 Navy vessels and nine Coast Guard vessels, ordered (or to be ordered) by the U.S. government, are now the economic mainstay of the industry.

At the start of the decade of the 1970s, fewer than 40,000 workers in private shipyards were engaged in naval ship construction. As a result of an expanding workload, this force grew to 80,000 by mid-1979. This expansion was attended by many difficulties, including schedule slippages, cost overruns, and a resulting adversary relationship between some shipyards and the Navy. At the end of 1981, the number of workers engaged in naval construction had fallen to about 58,000 and is expected to fall still further to about 45,000 given currently funded work. If given the task of building a larger Navy in the future, the shipbuilding industry would have to expand again and the costs of recruitment and training and other turbulence caused by expansion might be reflected in higher prices for ship construction.

THE OPTIONS--INDUSTRY IMPLICATIONS

The Institute for Defense Analyses (IDA) study cited earlier investigated the capacity of the industry to support a series of 14-year shipbuilding programs resulting in fleet sizes ranging from 500 to 800 ships. Some conclusions of that study can be summarized as follows:

- o 500-Ship Force. Easily supported by existing shipyards, less than half would be provided a viable workload. Attrition of many small and some large yards would be likely.
- o 600-Ship Force. Also easily within the capacity of the existing shipyards. Some shrinkage of the industry would be likely.
- o 700-Ship Force. Begins to tax the capacity of the present industrial base, as limited by labor and components supply factors under peacetime conditions. Some delays would occur because of the limited number of nuclear-qualified yards.

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- o 800-Ship Force. Would press the capacity of all existing private and naval shipyards, particularly with regard to labor and components. Would probably need to expand the number of nuclear-qualified building yards.

The four options in this report were specifically analyzed using the computer model developed by IDA for its study. This model, called IDASAS for Institute for Defense Analyses Ship Allocation System, sequentially allocates the ships of an inputted shipbuilding program to the various shipyards (as governed by the various constraints programmed into the model.) It then calculates, among other things, the number of shipyards required to produce the ships and the total employment levels necessary to carry out the program. The IDASAS results, it should be emphasized, express the full effect of only selected critical factors affecting shipbuilding output, chiefly building positions within the shipyards and labor supply. All IDASAS results, therefore, are really minimum estimates of the number of yards that might be required under normal conditions.

The results of the IDASAS runs for Options I through IV are summarized in Table 16. IDASAS calculates that as few as five to nine shipyards could support the new construction requirements of the four program options considered and that average man-year requirements would not exceed 59,000. A comparison of these results with the resources available (as of December 1980) suggests that adequate shipbuilding capacity is available for any of the four options.

The IDASAS model tries to maximize the utilization of shipyard facilities so as to calculate the minimum number of shipyards required. The number of required yards shown in Table 16, therefore, understates the number that could be supported as economically viable enterprises under the four options. In reality more shipyards, perhaps twice as many, would probably be used to support the building program in any of these options. This would allow for capacity to accommodate the unforeseen delays and interferences that are inevitable in real-life ship construction and would maintain a larger industrial base for surge requirements.

The results of the IDASAS assessment indicate that, given the currently available facilities, the capacity of the industrial base is unlikely to be a constraint for any of the four options considered. The key shipbuilding industry problem at the

TABLE 16. SUMMARY OF RESULTS OF IDASAS CALCULATION OF MINIMUM INDUSTRIAL REQUIREMENTS FOR FOUR OPTIONS

Option	Number of Ships Built	Number of Shipyards Required	Total Man-years Required (In thousands)	Average Annual Man-years Required (In thousands)
I	176	9	355	59
II	230	7	530	53
III	146	5	279	28
IV	231	9	530	38

present time is acquiring adequate work to sustain itself. If such work does not materialize, then there may be a substantial contraction of the shipbuilding industry in the next few years. If that should occur then sufficient industrial capacity to support a naval expansion program could become a problem in the future.

CHAPTER V. OVERALL COST IMPLICATIONS OF NAVAL FORCE EXPANSION

The costs outlined for the four options in Chapter III and explained in more detail in the appendixes are just those funded in the Shipbuilding and Conversion, Navy (SCN) authorization. A buildup of naval force will, of course, lead to additional costs in other budget categories as well. These additional costs are interrelated and spread across a wide spectrum of activities. Calculating them is a complex and laborious process. CBO, however, has developed a computer model called the Defense Resources Model (DRM) that automates much of this process, making possible relatively rapid estimates of the overall budgetary effects of changes in procurement plans. For a more detailed discussion of the methods used to derive the overall budget authority estimates, see Appendix F. For each of the shipbuilding program options considered in this report, the DRM was used to estimate the overall budgetary implications for the Department of the Navy.

In addition, CBO is preparing two companion reports to this paper that specifically examine two other important aspects of the proposed expansion of the Navy. One of these, The Budgetary Implications of Modernizing and Expanding Carrier-Based Air Forces (forthcoming), examines procurement of aircraft for the additional air wings needed to support a larger aircraft carrier force, and the other, Manning the 600-Ship Navy: Requirements Versus Supply (forthcoming), examines the manpower requirements of the Navy under the same four options considered here.

OTHER COST CATEGORIES

Many types of costs would be affected by a Navy buildup. Some major categories are discussed below. In estimating future costs, the Defense Resources Model used cost and other relationships based on the budget approved by the Congress for fiscal year 1982. Cost factors were updated to fiscal year 1983 dollars by adding the amount of overall price growth that CBO expects to occur. Cost increases from factors other than inflation are not included in these estimates.

Aircraft Procurement, Navy (APN)

Growth in the number of aircraft carriers in the Navy would require procurement of aircraft to form additional air wings. Because of the high cost of today's high-performance naval aircraft, this would be a substantial budget item. The aircraft needed to form a new air wing for a new $3.6 billion aircraft carrier would probably cost about $5.6 billion. The $5.6 billion includes the cost of aircraft assigned to carrier squadrons, plus those for training squadrons, the repair pipeline, and advance attrition aircraft for 15 years. The Navy not only plans to expand the number of air wings; it is also modernizing existing wings. Costs of this modernization program are included in the estimates.

All estimates assume the Navy's plan for modernization and expansion of its air forces. Thus costs assume that all carriers, except the Coral Sea and Midway, would be equipped with the F-14 as the fighter/interceptor aircraft; fighter/interceptors protect carriers from enemy bombers and escort attack aircraft. The F/A-18 and the A-6E are the aircraft designated for light and medium attack roles, respectively. Attack aircraft are used to deliver ordnance against land and sea targets. The S-3A is included as the antisubmarine aircraft. 1/ Other, more minor, aviation missions are to be carried out using aircraft types planned by the Navy.

The exact year when these many types of aircraft would be procured does not necessarily reflect the Navy's detailed plans, but rather a reasonable profile coordinated with the time when ships would enter the fleet under the various options in this report. The annual rates of aircraft procurement are consistent with those in recent Department of Defense procurement plans provided to the Congress.

Weapons Procurement, Navy (WPN)

The weapons employed by the Navy's ships and aircraft are procured in the WPN account. This includes the many different types of sophisticated missiles and torpedoes that have become

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1/ The S-3A aircraft is not currently being procured. Costs in this report assume that the production line would be reopened.

the costly cutting edge of modern naval combat systems. It is anticipated that this account will grow in the future, because of a continuation of the trend toward use of sophisticated weapons in naval combat systems and deployment of these weapons as part of the Navy's modernization program. Also, an increase in the number of ships and aircraft, as currently proposed by the Navy, would require increased procurement of weapons to support the larger force. Estimates in this report assume that total purchases of most Navy weapons--including the costly, sophisticated weapons--would expand in rough proportion to the increases in numbers of ships and aircraft.

Operation and Maintenance, Navy (OMN)

The OMN account contains funds to support the many activities necessary to operate and maintain the fleet, including fuel, spare parts, pay for the Navy's civilian employees, and depot repair of ships and aircraft. Clearly, growth in this account can be expected as the number of ships and aircraft in the Navy grows.

Estimates in this report assume that those funds that are directly related to the number of ships or aircraft in service, such as the fuel, spare parts, and maintenance for a particular weapon, are increased in proportion to the increased numbers of ships or aircraft in the fleet requiring these items. The rest of the operation and maintenance account, which cannot be directly related to the number of ships and aircraft, remains at its present level.

The factors used to estimate operation and maintenance funds are based on the 1982 budget, adjusted only for estimated price growth between 1982 and 1983. Thus any policy changes related to operation and maintenance funds, such as those proposed in the 1983 budget to improve readiness, are not reflected in these estimates. Costs for civilian personnel, which are included in the operation and maintenance account, reflect actual and planned pay raises through October 1, 1982.

Military Personnel, Navy (MPN)

The MPN account contains funds to pay the Navy's uniformed personnel. An increase in the Navy's force levels would require an increase in military personnel strength and, therefore, an increase in the military personnel budget. Estimates of

personnel costs reflect numbers of personnel needed to man ships and aircraft, assuming manning levels consistent with the budget for fiscal year 1982. Sufficient personnel are added to the shore establishment to ensure that the percentage of time people spend deployed on ships or aircraft remains at current levels. The costs of these added personnel, both those deployed and those ashore, are estimated based on pay raises through October 1, 1982.

Military personnel costs for Options I, II, and IV could be understated because of potential recruiting and retention problems. Between 1982 and 1987, the projected supply of recruits volunteering for naval service seems adequate to maintain the current quality of new recruits while also meeting numerical requirements. This assumes that pay raises beyond 1982 keep pace with those in the private sector. Beyond 1987, however, recruiting and retention might not be sufficient to meet requirements. The Navy could eliminate recruiting problems by lowering quality standards for entering recruits. Alternatively, the Navy could limit demand for male recruits, who are in short supply, by increasing numbers of female recruits, who are generally not in short supply. Without these or other changes in personnel policies, additional money might be needed for bonuses to keep up needed recruiting and retention levels. 3/ Since the need for these added sums would depend on detailed personnel policies, they were not included in the cost estimates in this report.

The estimates for all the options understate long-run manpower costs because they exclude one major category of personnel costs--funds for military retirement. Under current budget procedures, funds for military retirement appear in the budget only after persons complete their career, which usually takes at least 20 years, and retire. Thus this naval buildup would not increase retirement costs significantly for at least 20 years. On the other hand, the Administration has recommended paying for military retirement on an "accrual" basis. This would require budgeting now for future retirement costs. If this system were in effect, costs for military personnel would increase by about 30 percent over those in this report.

3/ See Congressional Budget Office, Manning the 600-Ship Navy: Requirements Versus Supply (forthcoming).

Other Costs

There are other types of costs that generally do not vary as distinctly with increases in numbers of ships and aircraft. Among these are costs for research and development, military construction, and family housing. These costs are included in the estimates, generally increasing according to recent plans through 1987 but remaining constant thereafter. Budget authority for the Marine Corps, which is included in the budget of the Department of the Navy, is also shown. Marine Corps budget authority remains essentially constant at its current level, although a small portion does vary with the number or ships and aircraft in the fleet.

COSTS OF THE FUTURE NAVY--ESTIMATES FOR THE FOUR OPTIONS

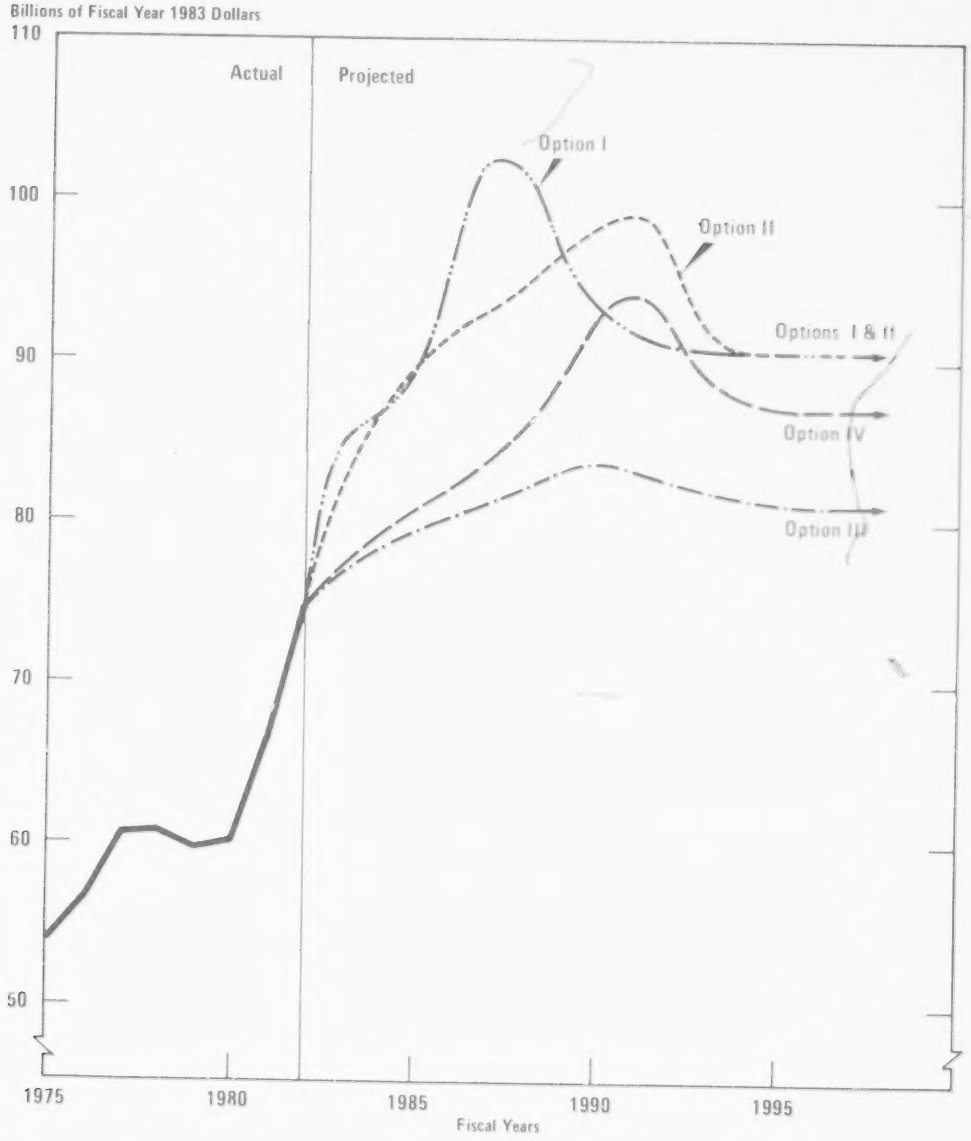
Estimates for the Department of the Navy budget required for each option, in fiscal year 1983 dollars, are shown in Tables 17 through 20, at the end of this chapter. As is the case with most projections, these numbers become increasingly speculative as one moves further into the future. Figure 2 plots these budget projections for the four options, together with recent actual levels of Navy budget authority.

The steepest increases in budget authority would be required for Option I, with Options II, IV, and III having successively lower budget requirements in that order. These projections (data are faired in the later years to illustrate trends more clearly) show budget authority peaking at about $102 billion for Option I and then settling back to a sustaining level of just over $90 billion. Similarly Option II peaks at about $99 billion before settling to a sustaining level of about $90 billion per year. The peak occurs later for Option II than for Option I, because of the accelerated procurement for the force buildup in Option I, but both resolve to about the same sustaining level since both options eventually arrive at the same force goal. Similarly, Option IV experiences a peak at about $94 billion and then resolves to a sustaining budget level of $87 billion.

Budget levels for Option III rise at a slower rate than for the other options and steady at a sustaining rate of about $76 billion. Option III, which resulted in a smaller fleet size than the other options, would have the lowest budget authority requirement.

Figure 2.

Navy Budget Authority Since 1975 and Projected to 1995 Under Four Program Options



The estimates in this report do not include the effects of growth in weapons costs because of factors such as price underestimates or changes in the weapons systems. There could also be price growth in the operation and maintenance account, if readiness improvements were achieved, and in the personnel accounts to reflect real pay growth in the economy. No money is set aside for such increases. While these factors could drive up future Navy budgets, the economy itself would, it is hoped, also grow over this lengthy period. Thus, these added costs might not increase the burden on the economy imposed by Navy spending.

Finally, all these budget projections are stated in terms of fiscal year 1983 dollars. The effects of general economic inflation are not included in the estimates presented. Actual future budgets, stated in terms of future-year dollars, would, of course, be higher than the numbers shown here, as would costs of most other federal and private endeavors.

TABLE 17. OPTION I: ESTIMATED BUDGET AUTHORITY FOR DEPARTMENT OF THE NAVY (By Fiscal Year, in Billions of Fiscal Year 1983 Dollars)

	1982	1983	1984	1985	1986	1987
SCN a/	9.6	19.8	20.8	22.0	26.1	32.5
APN b/	8.1	7.8	7.7	8.3	9.6	9.8
WPN	3.4	3.7	3.5	3.5	3.5	3.8
MPN c/	11.5	11.6	11.7	11.8	12.0	12.2
O&MN	20.1	20.3	20.4	20.6	20.9	21.7
Other BA d/	13.0	13.1	13.0	14.1	14.7	13.2
Subtotal, Navy e/	65.7	76.3	77.1	80.3	86.8	93.2
Subtotal, Marines f/	8.9	8.7	9.4	9.2	9.1	9.0
Total, Department of the Navy	74.6	85.0	86.5	89.5	95.9	102.2

(continued)

a/ Assumes new construction accounts for 80 percent of total SCN budget requirement.

b/ APN for the AV-8B, as well as certain APN which varies with aircraft force levels, are included in Marine related budget authority.

c/ MPN includes military pay raises through October 1, 1982.

TABLE 17. (Continued)

	1988	1989	1990	1991	1992
SCN a/	29.8	13.8	13.8	13.8	13.8
APN b/	10.0	10.9	11.7	11.5	11.2
WPN	5.3	6.8	7.3	7.4	7.4
MPN c/	12.6	13.1	13.5	14.0	14.4
O&MN	21.7	22.4	23.0	23.5	23.9
Other BA d/	13.6	13.9	14.0	14.1	14.2
Subtotal, Navy d/	93.0	80.9	83.3	84.3	84.9
Subtotal, Marines	8.8	8.2	7.8	7.8	7.8
Total, Department of the Navy	101.8	89.1	91.1	92.1	92.7

d/ Includes all remaining fleet budget authority, such as Marine Corps costs generated by Navy force activities, all research, development, test, and evaluation (RDT&E), family housing, and military construction.

e/ Excludes Navy costs generated by Marine Corps activity, such as aircraft personnel, as well as small elements of APN, WPN, and Other BA.

f/ Includes all Marine budget authority except that generated by Navy forces.

TABLE 18. OPTION II: ESTIMATED BUDGET AUTHORITY FOR DEPARTMENT OF THE NAVY (By Fiscal Year, in Billions of Fiscal Year 1983 Dollars)

	1982	1983	1984	1985	1986	1987	1988	1989
SCN a/	9.6	17.1	20.5	22.4	23.1	23.4	21.8	23.1
APN b/	8.1	7.8	7.7	8.3	9.6	9.8	10.0	10.1
WPN	3.4	3.7	3.5	3.7	3.4	3.7	5.2	6.6
MPN c/	11.5	11.6	11.7	11.8	12.0	12.2	12.4	12.7
O&MN	20.1	20.3	20.4	20.6	20.9	21.3	21.6	22.1
Other BA d/	13.0	13.1	12.9	14.0	13.3	13.2	13.5	13.8
Subtotal, Navy e/	65.7	73.6	76.7	80.8	82.3	83.6	84.5	88.4
Subtotal, Marines f/	8.9	8.7	9.4	9.2	9.1	9.0	8.8	8.2
Total, Department of the Navy	74.6	82.3	86.1	90.0	91.4	92.6	93.3	96.6

(continued)

a/ Assumes new construction accounts for 80 percent of total SCN budget requirement.

b/ APN for the AV-8B, as well as certain APN which varies with aircraft force levels, are included in Marine related budget authority.

c/ MPN includes military pay raises through October 1, 1982.

TABLE 18. (Continued)

	1990	1991	1992	1993	1994	1995	1996
SCN a/	22.3	22.1	21.5	13.8	13.8	13.8	13.8
APN b/	11.6	11.5	11.2	10.4	10.2	10.1	10.1
WPN	7.3	7.3	7.3	7.4	7.4	7.3	7.3
MPN c/	13.0	13.4	13.7	13.8	13.8	13.8	13.8
O&MN	22.6	23.0	23.0	23.1	23.1	23.0	23.0
Other BA d/	13.9	13.9	14.0	14.1	14.1	14.2	14.1
Subtotal, Navy e/	90.7	91.2	90.7	82.6	82.4	82.2	82.1
Subtotal, Marines f/	7.8	7.8	7.8	8.0	8.0	8.0	8.0
Total, Department Of the Navy	98.5	99.0	98.5	90.6	90.4	90.2	90.1

d/ Includes all remaining fleet budget authority, such as Marine Corps costs generated by Navy force activities, all research, development, test, and evaluation (RDT&E), family housing, and military construction.

e/ Excludes Navy costs generated by Marine Corps activity, such as aircraft personnel, as well as small elements of APN, WPN, and Other BA.

f/ Includes all Marine budget authority except that generated by Navy forces.

TABLE 19. OPTION III: ESTIMATED BUDGET AUTHORITY FOR DEPARTMENT OF THE NAVY (By Fiscal Year, in Billions of Fiscal Year 1983 Dollars)

	1982	1983	1984	1985	1986	1987	1988	1989
SCN a/	9.6	11.6	13.5	12.5	12.5	12.9	13.9	11.0
APN b/	8.1	7.8	7.7	8.3	9.2	9.0	9.0	9.3
WPN	3.4	3.7	3.5	3.2	2.9	3.1	5.1	5.7
MPN c/	11.5	11.6	11.7	11.8	12.0	12.0	11.9	12.0
O&M, Navy	20.1	20.3	23.0	20.6	20.9	21.1	21.2	21.6
Other BA d/	13.0	13.1	13.0	14.0	13.3	13.1	13.4	13.5
Subtotal, Navy e/	65.7	68.1	72.4	70.4	70.8	71.2	74.5	73.1
Subtotal, Marines f/	8.9	8.7	9.4	9.2	9.1	9.0	8.8	8.2
Total, Department of the Navy	74.6	76.8	81.8	79.6	79.9	80.2	83.3	81.3

(continued)

a/ Assumes new construction accounts for 80 percent of total SCN budget requirement.

b/ APN for the AV-8B, as well as certain APN which varies with aircraft force levels, are included in Marine related budget authority.

c/ MPN includes military pay raises through October 1, 1982.

TABLE 19. (Continued)

	1990	1991	1992	1993	1994	1995	1996
SCN a/	12.6	11.3	11.3	11.5	11.5	11.5	11.5
APN b/	9.4	9.7	9.3	8.9	8.9	8.9	8.9
WPN	6.7	6.7	6.7	6.7	6.7	6.7	6.7
MPN c/	12.0	12.1	12.1	11.9	11.8	11.7	11.5
O&MN	21.8	22.0	22.0	21.6	21.3	21.0	20.8
Other BA d/	13.6	13.5	13.5	13.5	13.6	13.5	13.3
Subtotal, Navy e/	76.1	75.1	74.9	74.1	73.8	73.3	72.7
Subtotal, Marines f/	7.8	7.8	7.8	8.0	8.0	8.0	8.0
Total, Department of the Navy	83.9	82.9	82.7	82.1	81.8	81.3	80.7

d/ Includes all remaining fleet budget authority, such as Marine Corps costs generated by Navy force activities, all research, development, test, and evaluation (RDT&E), family housing, and military construction.

e/ Excludes Navy costs generated by Marine Corps activity, such as aircraft personnel, as well as small elements of APN, WPN, and Other BA.

f/ Includes all Marine budget authority except that generated by Navy forces.

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TABLE 20. OPTION IV: ESTIMATED BUDGET AUTHORITY FOR DEPARTMENT OF THE NAVY ((By Fiscal Year, in Billions of Fiscal Year 1983 Dollars)

	1982	1983	1984	1985	1986	1987	1988	1989
SCN a/	9.6	12.0	13.1	14.0	13.5	15.0	14.9	16.0
APN b/	8.1	7.8	7.7	8.3	9.6	9.8	10.0	11.6
WPN	3.4	3.7	3.5	3.5	3.3	3.6	5.2	6.7
MPN c/	11.5	11.6	11.7	11.8	12.0	12.0	12.1	12.2
O&MN	20.1	20.3	20.4	20.6	20.9	21.2	21.3	21.6
Other BA d/	13.0	13.1	13.0	14.0	13.3	13.1	13.4	13.5
Subtotal, Navy e/	65.7	68.5	69.4	72.2	72.6	74.7	76.9	81.6
Subtotal, Marines f/	8.9	8.7	9.4	9.2	9.1	9.0	8.8	8.2
Total Department of the Navy BA	74.6	77.2	78.8	81.4	81.7	83.7	85.7	89.8

(continued)

a/ Assumes new construction accounts for 80 percent of total SCN budget requirement.

b/ APN for the AV-8B, as well as certain APN which varies with aircraft force levels, are included in Marine related budget authority.

c/ MPN includes military pay raises through October 1, 1982.

TABLE 20. (Continued)

	1990	1991	1992	1993	1994	1995	1996
SCN a/	18.5	16.9	17.3	11.9	11.9	11.9	11.9
APN b/	13.2	13.1	12.7	12.1	11.6	10.1	10.2
WPN	7.2	7.2	7.3	7.3	7.3	7.3	7.2
MPN c/	12.4	12.3	12.9	13.4	13.4	13.6	13.7
O&MN	22.0	22.3	22.4	22.3	22.2	22.2	22.4
Other BA d/	13.6	13.6	13.6	13.8	13.8	14.0	13.9
Subtotal, Navy e/	86.9	85.4	86.2	80.8	80.2	79.1	79.3
Subtotal, Marines f/	7.8	7.8	7.8	8.0	8.0	8.0	8.0
Total Department of the Navy BA	94.7	93.2	94.0	88.8	88.2	87.1	87.3

d/ Includes all remaining fleet budget authority, such as Marine Corps costs generated by Navy force activities, all research, development, test, and evaluation (RDT&E), family housing, and military construction.

e/ Excludes Navy costs generated by Marine Corps activity, such as aircraft personnel, as well as small elements of APN, WPN, and Other BA.

f/ Includes all Marine budget authority except that generated by Navy forces.

CHAPTER VI. CURRENT ISSUES FOR THE CONGRESS

The preceding chapters have outlined the goals of the Navy's proposed expansion program, its rationale, and its projected costs. Some alternative programs have been similarly outlined.

The Congress must now make decisions that will, either explicitly or by default, help to define the future Navy. Underlying these decisions should be a judgment about the wisdom of the Navy's offensive strategy, correlated with a judgment about what budget levels are feasible to support naval modernization or expansion.

BASIC DIRECTIONS

If the Congress agrees with the Navy's strategy and with the shipbuilding program derived from it, and if the Congress believes that the Navy's plans should be realized as soon as possible, then a program similar to Option I might be pursued. As shown in the preceding chapter, this would require substantial and immediate increases in the Navy's budget.

If the Congress agrees with the Navy's strategy and its resulting force expansion program, but believes that the force expansion can be achieved at a more measured pace, then a program such as that outlined in Option II might be appropriate. This would also require substantial increases in the Navy budget but the costs would be spread over a longer time than in Option I.

If the Congress agrees with the Navy's strategy and concurs with buying the types of ships derived from it, but does not provide the substantially increased funding required to support the Navy program, then the result might be the fleet of Option III. Option III also would require growth in the Navy's budget but at a much more modest rate than either Options I or II.

A judgment by the Congress that the Navy program is not advisable, either because Congress disagrees with the strategy upon which it is predicated or because the budgets implied are deemed to be infeasible, would mean that some alternative program must be developed. Option IV is one such program. It is a

relatively modest departure from the Navy program, intended to upgrade the Navy's capabilites for open-ocean, distributed-force operations as opposed to emphasizing concentrated carrier battle group operations.

Still more radical departures from the Navy's proposed program might be pursued. For example, a program emphasizing submarines at the expense of aircraft carriers and surface combatants is an option that some might find promising. Such an option might also emphasize high technology, including satellite surveillance and long-range precision guided munitions for tactical strikes. Other alternatives might emphasize land-based aircraft in lieu of sea-based tactical air power. All of these are possible and, perhaps, advisable, but they are not currently recommended by the Navy. The alternatives available to the Congress within the context of the Navy shipbuilding program would involve either sharply increased budgets or lower budgets that, given the high costs of the Navy's ships, would maintain the Navy at force levels now deemed inadequate by the Administration's naval planners.

THE FIVE-YEAR SHIPBUILDING PROGRAM

The five-year shipbuilding program proposed by the Administration in the fiscal year 1983 budget is shown in Table 21. It proposes authorization of 133 new ships and 16 conversions, service life extensions (SLEPs), and reactivations in fiscal years 1983 through 1987. The proposed budget for fiscal year 1983 contains authorizations for 18 new construction ships and 7 conversions/SLEPs/reactivations with a budget authority requirement of over $18.6 billion, about twice the budget authority requested in 1982. Although the Administration's program is clearly tending in the direction of Options I and II, it concentrates a majority of the new construction ships in the last two years and would, therefore, result in a force buildup more akin to Option II than Option I.

The Administration's five-year program is estimated to cost an average of about $19.3 billion annually over the five-year period, somewhat less than the $21.3 billion estimated for Option II. One reason for this lower cost is that the Administration's program contains relatively few of the expensive surface combatants that would be needed to reach the Navy's objectives for new-generation cruisers and destroyers.

TABLE 21. ADMINISTRATION'S PROPOSED SHIPBUILDING PROGRAM FOR FISCAL YEARS 1983-1987

Type of Ship	1982 a/	1983	1984	1985	1986	1987	1983-1987 Total
Trident (Ballistic Missile Submarine)	--	2	1	1	1	1	6
SSN-688 (Attack Submarine)	2	2	3	4	4	4	17
CVN (Aircraft Carrier-Nuclear)	--	2	--	--	--	--	2
CV (Aircraft Carrier) SLEP b/	--	1	--	1	--	1	3
CG-47 (Guided Missile Cruiser)	3	3	3	3	4	4	17
CG-42 (Nuclear Guided Missile Cruiser)	--	--	--	--	--	1	1
DDG-51 (Guided Missile Destroyer)	--	--	--	1	--	3	4
DD (Destroyer)	--	--	--	--	2	1	3
BB (Battleship) Reactivation	1	1	1	1	--	--	3
FFG-7 (Guided Missile Frigate)	3	2	2	2	3	3	12
MCM (Mine Countermeasure Ship)	1	4	4	5	--	--	13
MSH (Mine Countermeasure Ship)	--	--	1	--	5	5	11
LSD-41 (Landing Ship Dock)	1	1	1	2	2	2	8
LHD-1 (Amphibious Ship)	--	--	1	--	--	1	2
AOE (Multipurpose Stores Ship)	--	--	--	1	1	2	4
AE (Ammunition Ship)	--	--	--	1	2	1	4
ARS (Salvage Ship)	2	1	1	--	--	--	2
AD (Destroyer Tender)	--	--	--	--	1	1	2
T-AO (Oiler)	1	1	3	4	4	6	18
T-AGS (Ballistic Missile Submarine Support Ship) Conversion	--	--	--	2	--	--	2
T-AK (Cargo Ship) Conversion	--	--	--	1	--	--	1
T-ARC (Cable Ship)	--	--	--	--	1	--	1
T-AGM (Range Instrumentation Ship) Conversion	--	--	--	--	1	--	1
T-AGOS/AGOS (Surveillance Towed Array Sensor System)	4	--	1	--	2	3	6
T-AKRX (SL-7) Conversion c/	4	4	--	--	--	--	4
T-AFS (Stores Ship) Conversion	2	--	--	--	--	--	--
T-AH (Hospital Ship) Conversion	--	1	1	1	--	--	2
New Construction Ships	17	18	21	24	32	38	133
Conversions/SLEPs/ Reactivations	7	7	2	2	1	1	16

SOURCE: Department of Defense

NOTE: All ships, conversions, and service life extensions are proposed to be authorized in the year listed. They will not enter the fleet until later years.

a/ Included to provide comparison with the Administration's program.

b/ SLEP = Service Life Extension Program.

c/ Acquisition of eight T-AKRXs will be completed in fiscal year 1982.

Aircraft Carriers

The most striking feature of the proposed fiscal year 1983 Navy budget is the recommendation for two large-deck, nuclear-powered aircraft carriers (CVNs) of the Nimitz class. The Administration believes that this procurement strategy would permit simultaneous purchase of heavy equipment for the ships and serial fabrication of major subassemblies. This, they believe, would strengthen the vendor/contractor base and accelerate the delivery of each ship by as much as 21 months.

Authorization of the two aircraft carriers would be a key step in realizing the program goals of the Navy and would be seen as a strong endorsement of that program. Although the obligational authority for these ships would be nearly $7 billion, outlays in the first year would probably total less than 5 percent of that amount. Authorization, however, would commit the public to a large and continuing stream of outlays not only for continuing carrier construction in the years beyond 1983 but also for procuring aircraft for the carriers and for support of the ships and aircraft over their life cycles. These expenditures would probably total at least $19 billion over 30 years for each carrier. The carrier decision, therefore, carries a substantial commitment forward to future budgets.

As an alternative to expanding the large-deck carrier force, the Congress could direct the Navy to build smaller carriers. The Navy has argued that the 60,000-ton carriers considered in the late 1970s are not sufficiently less expensive than the 90,000-ton Nimitz-class carriers to be cost effective. Another alternative would be to develop a design for a much smaller aviation support ship such as a 12-15,000-ton aviation cruiser (CVG)--as proposed for Option IV in this report. The CVG would not operate in the same way as a 60,000-ton or 90,000-ton aircraft carrier--that is, to launch high-performance combat aircraft--but would provide long-range surveillance, targeting, and ASW capabilities to a dispersed group of U.S. and allied surface warships and submarines, enabling them to use their long-range weapons more effectively. Thus, the CVG would serve as a catalyst, enabling the Navy to distribute its strike capabilities more effectively among many ships rather than having them concentrated in a few very powerful warships.

To be effective, however, the CVG would require an efficient V/STOL aircraft, suitably equipped with sensors appropriate for detecting and identifying enemy units and communications for

relaying this information to U.S. and allied forces in the area. The key initiative for implementing a distributed force concept, such as that suggested here, might well be development of this V/STOL aircraft.

If the Congress elected not to authorize more large-deck carriers or to initiate an alternative approach, such as the CVG, then some of the current tempo-of-operations pressure on existing carriers might be relieved by forming additional battle groups around the newly reactivated battleships and using these for some of the deployment commitments now covered by aircraft carriers. This is discussed further below.

Battleship Reactivations

Last year the Congress authorized reactivation of the battleship New Jersey and appropriated $325 million for that purpose. In its five-year program, the Administration proposes to reactivate the three remaining Iowa-class battleships, with Iowa scheduled in the fiscal year 1983 budget at a cost of $445 million. These ships would be fitted with Tomahawk and Harpoon cruise missiles to augment their 16-inch guns and, the Administration argues, would be a formidable addition to the Navy's active forces. This addition could be made available relatively quickly and at a relatively lower cost than new ships.

Battleships could operate in a variety of roles in peacetime and wartime operations. The formidable-looking battleships could be useful in relieving the current at-sea operating pressure on aircraft carriers for peacetime-presence and crisis-response operations. As was discussed in Chapter II, in wartime battleships could operate as the centerpiece of surface action groups in strikes against coastal targets and in supporting amphibious operations.

Work required for reactivation of the three remaining battleships will be somewhat more extensive than for New Jersey. New Jersey was previously reactivated in the 1960s for service in the Vietnam war. The three other ships have been out of service since the 1950s and will require more work. Although reactivation costs are comparable to that of a new-construction frigate or destroyer, operating costs for the battleships, with their crew of more than 1,500 and World War II vintage machinery systems, may be rather high--but would certainly be much less than for aircraft carriers.

Trident Submarines

The Administration has proposed authorization of two Trident submarines in the fiscal year 1983 budget, for a total cost of about $2.8 billion. Trident submarines are normally procured at a rate of one per year. Last year, however, the Congress, citing continued delays in Trident submarine deliveries, did not authorize a Trident in the fiscal year 1982 budget. No force level goal has been established for Trident submarines, but authorization of two ships in 1983 would return the program to the schedule recommended by the Administration.

Trident submarines, fitted with 24 missile launchers, are intended eventually to replace the 31 "Poseidon" ballistic missile submarines (which have 16 missile launchers each) that are currently in the fleet. 1/ The Poseidon submarines were all commissioned during the 1960s and will reach their 20th year of service during the 1980s. These ships have been carefully maintained by the Navy, however, and could operate for many more years. Furthermore, after a relatively modest modification that can be accomplished outside a shipyard, the Poseidon submarines could be capable of launching the same Trident I missile now used by the new SSBNs. The new Trident II missile, when deployed, probably in the late 1980s, will be compatible only with the larger missile launchers fitted on the Trident submarines.

Surface Combatants

The Administration's five-year shipbuilding program contains 37 other surface combatants of various types in addition to the battleships. For fiscal year 1983, these includes three CG-47-class cruisers and two FFG-7-class frigates. Of the 37 ships, 25 are "battle group" surface combatants--cruisers and destroyers--and the remainder are FFG-7-class guided missile frigates, intended as escorts for convoys and groups of ships other than carrier battle groups.

1/ The term "Poseidon" submarine is often used to denote collectively the ships of the SSBN 616-, SSBN 627-, and SSBN 640-class submarines that were converted to launch the Poseidon rather than the Polaris missile.

Considerably more than 25 cruisers and destroyers would be needed to meet the Navy's force level goals, given the large number of ships of these types approaching 30 years of service in the late 1980s and 1990s. In Chapter III, it was estimated that delivery of 61 new cruisers and destroyers would be required to meet the Navy's force goals by 1992, and 84 by 1996. The 25 ships currently programmed are clearly only a fraction of that requirement.

Of the 25 cruisers and destroyers in the Administration's program, 22 will be equipped with AEGIS or AEGIS-derivative AAW systems. These will be expensive ships. The CG-47-class ships cost over $1 billion per ship and the CGN-42 class, proposed for construction starting in fiscal year 1987, will probably cost at least 50 percent more. CBO estimates that the DDG-51-class destroyer, scheduled for construction starting in fiscal year 1985, will have a follow-ship price of about $800 million (in fiscal year 1983 dollars.)

As was shown in the discussion of the options in Chapter III, procurement of surface combatants is not only an important, but the dominant, factor in proposed future Navy shipbuilding budgets. If Option II is used as a model, for example, 59 additional cruisers and destroyers, beyond those in the Administration's current five-year program, would have to be authorized in fiscal years 1988 through 1992 in order to meet the Navy's force level goals for surface combatants by 1996 (assuming four years from authorization to delivery). Given the prices of the ship types now proposed, the procurement cost of these 59 ships would exceed $60 billion in fiscal year 1983 dollars.

Clearly, development of a lower-cost surface combatant with adequate combat capability could have substantial long-term benefits. A ship such as DDGY, proposed in Option IV and discussed in more detail in Appendix E, is suggested as a surface combatant that would be both affordable and effective in future naval combat. The dominance of surface combatants in future shipbuilding budget projections marks the development of such a warship as a key initiative in planning future naval forces.

The Administration proposes to continue production of FFG-7-class guided missile frigates, although those previously authorized will build the frigate force level above the Navy's objective. The Administration says it plans to continue procurement of this "useful and relatively inexpensive ship" to meet escort needs

other than those for carrier battle groups. It also plans to assign earlier ships of this class to the Naval Reserve force.

Attack Submarines

The Administration's five-year program proposes construction of 17 SSN-688-class attack submarines, including two in the fiscal year 1983 budget. This is about the construction rate required to sustain a force of 100 submarines--the Navy's current force goal--in the long term, assuming an operating life of 30 years. Given the age profile of the current force, however, procuring that many submarines over the next five years would increase the force above the 100-ship goal, assuming a 30-year life, or conversly, allow retirement of older nuclear submarines before 30 years.

A key issue in this area--in addition to that of how many submarines should be procured--is what kind of attack submarines should be built. The Administration proposes to continue production of the SSN-688-class submarine (first authorized in fiscal year 1970) through fiscal year 1987 and for the foreseeable future. Efforts to design an alternative class of nuclear-powered submarines, undertaken during the previous Administration, have been dropped.

There has also been recent interest in the Congress and among some defense analysts in the possibility of resuming production of non-nuclear submarines. This interest has been stimulated further by a recent proposal by the German firm of Howaldswerke-Deutsche Werft (mentioned in Chapter III) to design and build a 2,600-ton diesel-electric submarine, fully equipped with a U.S.-built combat suite, for a lead-ship price of about $200 million. If diesel-electric submarines could be acquired at about that price, then they could be procured at a ratio of about three ships to one (on a discounted life-cycle cost basis), compared with the SSN-688. It has been suggested that a mixed force of nuclear and diesel-electric submarines could provide a larger, and, therefore, potentially more effective force for a given level of investment than an all nuclear submarine force. The Navy concedes that modern diesel-electric submarines could be very effective in some important missions, such as barrier patrols, but argues that these missions should allocated to allied submarines, while the United States continues to build only high-performance, nuclear-powered attack submarines.

Mine Warfare Ships

Two new types of mine warfare ships are proposed in the Administration's five-year program. These ships would replace the 25 aging ocean minesweepers (MSOs) now in the fleet, all but three of which are assigned to the Naval Reserve force.

The Administration proposes authorization of 15 mine countermeasure ships (MCMs) during the five-year period as follow-ships to the lead MCM that was authorized in fiscal year 1982. In addition, the five-year program includes 11 ships of a new class of smaller mine hunters, designated MSH. Of these two types, the MCM is the larger and more capable. The MSH would augment the MCM ships during initial mine clearance and harbor breakout operations. These ships would have improved systems for minesweeping (causing mines to explode harmlessly), mine hunting (locating mines in the water or on the ocean floor) and mine neutralization (rendering the mine harmless after it has been located). Mine hunting and mine neutralization are important functions in dealing with sophisticated modern mines. The MCM is intended to provide a capability to counter Soviet deep-water mines.

As was discussed in Chapter II, mines are a potent naval weapon. These ships should improve U.S. capabilities in an area in which the United States now may be quite vulnerable.

Amphibious Ships

The Administration's five-year plan proposes procurement of 10 amphibious ships during the 1983-1987 period. This includes eight ships of the LSD-41-class and two ships of a new type designated LHD. Although this program represents a much more active procurement of amphibious ships than has been the practice in recent years, these 10 ships would not be sufficient to realize the Navy's announced goal of increasing amphibious lift capability from 1 to 1.5 Marine Amphibious Force (MAF). 2/ Therefore, further construction of amphibious ships in the years beyond fiscal year 1987 will be required if the 1.5 MAF goal is to

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2/ In the 11-year period starting in fiscal year 1972, only two amphibious ships, LSD-41 and 42, were authorized.

be achieved. 3/ Indeed, the proposed program is actually no more than a start in the direction of building up amphibious lift capability. The eight LSDs would be sufficient only to replace eight existing ships of the LSD-28 class that will be retired between 1984 and 1987, assuming retirement after 30 years.

The LHD, or general purpose amphibious assault ship, is a new initiative in amphibious ship design intended by the Administration to provide a net increase in amphibious lift capability. It will be based on the design of the Amphibious Assault Ship (LHA) and would replace the seven Helicopter Landing Ships (LPHs) scheduled for retirement in the mid-1990s. It will be a large ship, of about 40,000-tons displacement, and will be specifically designed to support high-speed landing craft air cushion (LCAC) vehicles and V/STOL aircraft. The Administration is also examining potential uses of the LHDs as V/STOL support platforms for diversifying and broadening the offensive aviation capabilities of the fleet. The LHD will be expensive, however, with the lead-ship procurement cost estimated at over $1 billion.

The Administration is also planning a third type of new amphibious ship, in the landing platform dock (LPD). This ship type is similar in size to the LSD-41 class and would carry a mixed load of troops, vehicles, cargo, LCACs, and helicopters. These ships, now designated LPDX, would replace LPDs now in the fleet. The Administration's current planning envisions authorization of the lead ship in fiscal year 1988.

Amphibious ships are different from the ships that have been procured in recent years to support mobility enhancement, particularly for support of the Rapid Deployment Force (RDF). The mobility-enhancement ships developed for the RDF are conversions or adaptations of merchant ship designs and require some developed port facilities for off-loading. They are appropriate for unopposed landings or for support of forces after a successful landing. Amphibious ships, on the other hand, are designed to support opposed landings and to discharge troops and equipment without the use of port facilities.

3/ Ongoing reappraisals by the Navy and Marine Corps of the lift capacity required for amphibious forces may result in still larger capacity requirements for achieving the 1.5 MAF lift goal.

Replenishment Ships

The Administration's five-year shipbuilding program contains a total of 26 replenishment ships, only one of which is included in the fiscal year 1983 budget. Replenishment ships, which provide fuel, ammunition, and stores to naval ships at sea, are essential to the Navy's ability to conduct sustained operations at sea. Growth in naval combat forces should be accompanied by a comparable growth in underway replenishment ships.

The Administration program includes four fast combat support ships (AOEs), four ammunition ships (AEs) and 18 fleet oilers (AOs). In addition, two combat stores ships (AFS) were recently purchased from the Royal Navy. The 26 ships in the Administration's proposal come close to the 29-ship program for replenishment ships contained in Option I. This program, if sustained in future budget requests and authorized by the Congress, would represent significant progress in improving the Navy's replenishment capabilities.

Support Ships

The Administration's five-year shipbuilding program also contains recommendations for procuring various types of support ships. These recommendations include no submarine tenders (ASs), however, and only two destroyer tenders (ADs) programmed in the last two years of the plan. The present material support ship force contains 26 ships-- 13 ASs, 9 ADs, and 4 repair ships (ARs). Assuming retirement of these ships at 40 years, this force would shrink to 15 ships--6 ADs and 9ASs--by 1986, the year in which the first new tender is programmed for authorization. The currently proposed program, therefore, would result in a substantial reduction in the number of tenders while the fleet they serve is growing, unless many of the current tenders were retained into their fifth decade of service.

SUMMARY ASSESSMENT OF THE FIVE-YEAR SHIPBUILDING PLAN

The Administration's five-year shipbuilding plan, containing 133 new construction ships and estimated to cost over $80 billion in fiscal year 1983 dollars, is more ambitious than previous programs submitted to the Congress in the past few years. It does not, however, contain enough ships to realize the Navy's announced force level goals for an expanded Navy. In addition, this plan--as has been the case with so many previous plans--has most of its

ships programmed in the later out-years. Over half of the 133 new construction ships are programmed for the last two years of the five-year plan. Achievement of the Navy's expanded force level goals would require adhering to the out-year building plans and continued high levels of construction in the years beyond fiscal year 1987.

APPENDIXES

APPENDIX A. OPTION I: NAVY FORCE OBJECTIVES--SHIPS IN FLEET BY 1992 AND AUTHORIZED BY 1988

This appendix contains tables presenting, in detail, an illustrative shipbuilding program for Option I (see Table A-1) and a year-by-year breakdown of the force structure that would result from that building program (see Table A-2) taking into account the structure of the current fleet and assumed retirements through 1992. In this option, the objective is to achieve the Navy's force level goals by the end of 1992. In developing the force structure projections, assumptions about years of service until ship retirement (from commissioning date) and building time (from authorization to delivery) are as follows:

Retirement Assumptions	Building Time Assumptions
50 Years	Aircraft Carriers (CVN)--8 years
Aircraft Carriers (CV/CVN)	Ballistic Missile Submarine (SSBN)--6 Years
40 Years	Nuclear Powered Guided Missile Cruiser (CGN)--5 years
Destroyer Tenders (AD)	Nuclear Powered Attack Submarine (SSN)--5 years
Submarine Tenders (AS)	All others--4 years
Repair Ships (AR)	
Fleet Oilers (AO/TAO)	
Salvage Ship (ARS)	
Submarine Rescue Ship (ASR)	
Fleet Tug (ATF/TATF)	
30 Years	
All others	

Under these assumptions, ships actually in the fleet by 1992 must be authorized no later than 1988.

Certain types of reserve and support ships, which are not included in the Navy's current ship counting methodology, are not included in these listings.

TABLE A-1. ILLUSTRATIVE SHIPBUILDING PROGRAM FOR OPTION I: NAVY FORCE OBJECTIVES--SHIPS IN FLEET BY 1992 AND AUTHORIZED BY 1988 (By fiscal year, costs in billions of fiscal year 1983 dollars)

Ship Type	1983		1984		1985		1986	
	Ships	Cost	Ships	Cost	Ships	Cost	Ships	Cost
Strategic								
SSBN (Trident)	1	1.4	1	1.4	1	1.4	1	1.4
General Purpose								
Combatants								
Aircraft carrier (CVN)	1	3.5			1	3.5		
Battleship (BB)	1	0.45	1	0.45	1	0.45		
Cruiser (CGN)			1	2.15			3	5.25
Cruiser (CG)	3	3.4	4	4.55	3	3.4	4	4.55
Destroyer (DDG)			1	1.25			4	3.2
Destroyer (DD)					6	3.0		
Submarine (SSN)	2	1.4	1	0.7	1	0.7	2	1.4
Amphibious Ships								
Amphib. assault ship (LHD)							1	1.3
Amphib. transport dock (LPD)								
Landing ship dock (LSD)	4	1.6	5	2.0	4	1.6		
Mine Warfare Ships								
Mine countermeasure ship (MCM)	6	0.6	6	0.65	5	0.5		
Mine warfare ship (MSH)			1	0.1	3	0.2	3	0.2
Replenishment Ships								
Fast combat support ship (AOE)							1	0.7
Oiler (AO/TAO)	4	1.2	4	1.2	4	1.2	2	0.6
Ammo. ship (AE/TAE)	1	0.45	2	0.80	1	0.40	1	0.40
Material Support Ships								
Destroyer tender (AD)	2	0.9	2	0.9	1	0.45	2	0.9
Submarine tender (AS)	1	0.45	1	0.45	1	0.45	1	0.45
Fleet Support Ships								
Surveillance ship (TAGOS)							2	0.2
Salvage ship (ARS)	1	0.10	1	0.1	1	0.1		
Total, All Ships	27	15.45	31	16.70	33	17.35	27	20.55

(continued)

TABLE A-1. (Continued)

Ship Type	1987 Ships	1987 Cost	1988 Ships	1988 Cost	Total Type	Total Type Cost	Percent of Total Cost All Ships
Strategic							
SSBN (Trident)	1	1.4	1	1.4	6	8.4	7
General Purpose							
Combatants							
Aircraft carrier (CVN)	1	3.5			3	10.5	9
Battleship (BB)					3	1.35	
Cruiser (CGN)	3	5.25	3	5.25	10	17.9	55
Cruiser (CG)	3	3.4	3	3.4	20	22.7	
Destroyer (DDG)	10	8.0	10	8.0	25	20.45	
Destroyer (DD)					6	3.0	
Submarine (SSN)	2	1.4	1	0.7	9	6.3	5
Amphibious Ships							
Amphib. assault ship (LHD)			2	2.0	3	3.3	
Amphib. transport dock (LPD)	1	0.7			1	0.7	8
Landing ship dock (LSD)					13	5.2	
Mine Warfare Ships							
Mine countermeasure ship (MCM)					17	1.75	2
Mine warfare ship (MSH)	3	0.2	3	0.2	13	0.9	
Replenishment Ships							
Fast combat support ship	1	0.5	2	1.0	4	2.2	
Oiler (AO/TAO)	3	0.9			17	5.1	9
Ammo. ship (AE/TAE)			3	1.20	8	3.25	
Material Support Ships							
Destroyer tender (AD)	1	0.45	1	0.45	9	4.05	5
Submarine tender (AS)					4	1.8	
Fleet Support Ships							
Surveillance ship (TAGOS)					2	0.2	<1
Salvage ship (ARS)					3	0.3	
Total, All Ships	29	25.70	29	23.60	176	119.35	

TABLE A-2. ILLUSTRATIVE FORCE STRUCTURE FOR OPTION 1: NAVY FORCE OBJECTIVES--SHIPS IN FLEET BY 1992 AND AUTHORIZED BY 1988 (By fiscal year)

Ship Type	1981 End	1982 Re-tire	1982 Add	1982 End	1983 Re-tire	1983 Add	1983 End	1984 Re-tire	1984 Add	1984 End	1985 Re-tire	1985 Add	1985 End
Strategic													
SSBN (Poseidon)	34	3		31			31			31			31
SSBN (Trident)	1		1	2		1	3		1	4		2	6
Total, Strategic	35			33			34			35			37
General Purpose													
Combatants													
Aircraft carrier (CVN)	3	0	1	4			4			4			4
Aircraft carrier (CV)	9			9			9			9			9
Battleship (BB)	0			0		1	1		1	2		1	3
Cruiser (CGN)	9			9			9			9			9
Cruiser (CG)	18			18		1	19		1	20		1	21
Destroyer (DDG)	41			41			41			41			41
Destroyer (DD)	44			44		1	45			45			45
Frigate (FFG)	22		8	30		10	40		5	45		5	50
Frigate (FF)	59			59			59			59			59
Submarine (SSN)	86		6	92		5	97		4	101		2	103
Submarine (SS)	5			5			5			5			5
Small combat (PG/PHM)	5	2	3	6			6			6			6
Subtotal, Combatants	301			317			335			346			355
Amphibious Ships													
Helo assault ship (LHA/LHD)	5			5			5			5			5
Dock transport (LPD)	13			13			13			13			13
Helo transport ship (LPH)	7			7			7			7			7
Landing ship dock (LSD)	13			13			13	1	1	13	3		10
Landing ship tank (LST)	20			20			20			20			20
Command ship (LCC)	2			2			2			2			2
Assault transport (LKA)	5			5			5			5			5
Subtotal, Amphibious	65			65			65			65			62
Mine Warfare Ships													
Ocean minesweeper (MSO)	25	4	0	21			21	11		10	6		4
Mine warfare ship (MCM)	0			0			0			0			0
Mine warfare ship (MSh)	0			0			0			0			0
Subtotal, Mine Warfare	25			21			21			10			4
Replenishment Ships													
Station ship (AOE)	4			4			4			4			4
Station ship (AOR)	7			7			7			7			7
Oiler (AO/.AO)	19	1	2	20			20	2		18	3		15
Ammo. ship (AE/TAE)	13			13			13			13			13
Stores ship (AFS/TAFS)	10			10			10			10	1		9
Subtotal, Replenishment	53			54			54			52			48
Material Support Ships													
Destroyer tender (AD)	9	1	1	9	2	1	8	2		6			6
Submarine tender (AS)	13			13	1		12	1		11	1		10
Repair ship (AR)	4			4	1		3	1		2	2		0
Subtotal, Material Sup.	26			26			23			19			16
Fleet Support Ships													
Surveillance ship (TAGOS)	0			0		3	3		5	8		4	12
Salvage ship (ARS)	7			7			7			7		1	8
Rescue ship (ASR)	6			6	1		5			5			5
Salvage/rescue ship (ATS)	3			3			3			3			3
Fleet tug (ATF/TATF)	14			14			14	4		10	3		7
Subtotal, Fleet Sup.	30			30			32			33			35
Total, General Purpose	500			513			530			525			520
Total, All Ships	535			546			564			560			557

RETIREMENT ASSUMPTIONS: 50 years--CV/CVN; 40 years--AD, AS, AR, AO/TAO, ARS, ASR, ATF; 30 years--all others .

TABLE A-2. (Continued)

Ship Type	1986 Re-tire	1986 Add	1986 End	1987 Re-tire	1987 Add	1987 End	1988 Re-tire	1988 Add	1988 End	1989 Re-tire	1989 Add	1989 End
Strategic												
SSBN (Poseidon)			31			31			31			31
SSBN (Trident)		1	7		2	9			9		1	10
Total, Strategic			38			40			40			41
General Purpose												
Combatants												
Aircraft carrier (CVN)			4			4		1	5			5
Aircraft carrier (CV)			9			9			9			9
Battleship (BB)		1	4			4			4			4
Cruiser (CGN)			9			9			9		1	10
Cruiser (CG)		4	25		3	28		4	32		3	35
Destroyer (DDG)	1		40	1		39		1	40	1		39
Destroyer (DD)	2		43	4		39	4		35	4	6	37
Frigate (FFG)		4	54			54			54			54
Frigate (FF)			59			59			59			59
Submarine (SSN)		4	107	1	3	109	2	2	109	2	1	108
Submarine (SS)			5	1		4	1		3	2		1
Small combat (PG/PHM)			6			6			6			6
Subtotal, Combatants			365			364			365			367
Amphibious Ships												
Helo assault ship (LHA/LHD)			5			5			5			5
Dock transport (LPD)			13			13			13			13
Helo transport ship (LPH)			7			7			7			7
Landing ship dock (LSD)	2	1	9	2	4	11		5	16		4	20
Landing ship tank (LST)			20			20			20			20
Command ship (LCC)			2			2			2			2
Assault transport (LKA)			5			5			5			5
Subtotal, Amphibious			61			63			68			72
Mine Warfare Ships												
Ocean minesweeper (MSO)	2		2	1		1			1	1		0
Mine warfare ship (MCM)		1	1		6	7		6	13		5	18
Mine warfare ship (MSH)			0			0		1	1		3	4
Subtotal, Mine Warfare			3			8			15			22
Replenishment Ships												
Station ship (AOE)			4			4			4			4
Station ship (AOR)			7			7			7			7
Oiler (AO/TAO)	4	1	12		4	16		4	20		4	24
Ammo. ship (AE/TAE)			13	2	1	12		2	14	2	1	13
Stores ship (AFS/TAFS)			9			9			9			9
Subtotal, Replenishment			45			48			54			57
Material Support Ships												
Destroyer tender (AD)			6		2	8		2	10		1	11
Submarine tender (AS)	1		9		1	10		1	11		1	12
Repair ship (AR)			0			0			0			0
Subtotal, Material Sup.			15			18			21			23
Fleet Support Ships												
Surveillance ship (TAGOS)			12			12			12			12
Salvage ship (ARS)	3	2	7	3	1	5		1	6		1	7
Rescue ship (ASR)	2		3	1		2			2			2
Salvage/rescue ship (ATS)			3			3			3			3
Fleet tug (ATF/TATF)			7			7			7			7
Subtotal, Fleet Sup.			32			29			30			31
Total, General Purpose			521			530			553			572
Total, All Ships			559			570			593			613

BUILDING TIME ASSUMPTIONS: CVN--8 years; SSBN--6 years; CGN--5 years; SSN--5 years; all others --4 years.

TABLE A-2. (Continued)

Ship Type	1990 Re-tire	1990 Add	1990 End	1991 Re-tire	1991 Add	1991 End	1992 Re-tire	1992 Add	1992 End
Strategic									
SSBN (Poseidon)			31			31			31
SSBN (Trident)		1	11		1	12		1	13
Total, Strategic			42			43			44
General Purpose									
Combatants									
Aircraft carrier (CVN)			5		1	6			6
Aircraft carrier (CV)			9			9			9
Battleship (BB)			4			4			4
Cruiser (CGN)			10	1	3	12	1	3	14
Cruiser (CG)		4	39		3	42	1	3	44
Destroyer (DDG)	6	4	37	9	10	38	9	10	39
Destroyer (DD)			37			37			37
Frigate (FFG)			54			54			54
Frigate (FF)			59			59			59
Submarine (SSN)	4	1	105	6	2	101	3	2	100
Submarine (SS)	1		0			0			0
Small combat (PG/PHM)			6			6			6
Subtotal, Combatants			365			368			372
Amphibious Ships									
Helo. assault ship (LHA/LHD)		1	6			6		2	8
Dock transport (LPD)			13		1	14	1		13
Helo. transport ship (LPH)			7	1		6	1		5
Landing ship dock (LSD)			20			20			20
Landing ship tank (LST)			20			20			20
Command ship (LCC)			2			2			2
Assault transport (LKA)			5			5			5
Subtotal, Amphibious			73			73			73
Mine Warfare Ships									
Ocean minesweeper (MSO)			0			0			0
Mine warfare ship (MCM)			18			18			18
Mine warfare ship (MSH)		3	7		3	10		3	13
Subtotal, Mine Warfare			25			28			31
Replenishment Ships									
Station ship (AOE)		1	5		1	6		2	8
Station ship (AOE)			7			7			7
Oiler (AO/TAO)		2	26		3	29			29
Ammo. ship (AE/TAE)	1	1	13			13		3	16
Stores ship (AFS/TAFS)			9			9			9
Subtotal, Replenishment			60			64			69
Material Support Ships									
Destroyer tender (AD)	1	2	12		1	13		1	14
Submarine tender (AS)		1	13			13			13
Repair ship (AR)			0			0			0
Subtotal, Material Sup.			25			26			27
Fleet Support Ships									
Surveillance ship (TAGOS)		2	14			14			14
Salvage ship (ARS)			7			7			7
Rescue ship (ASR)			2			2			2
Salvage/rescue ship (ATS)			3			3			3
Fleet tug (ATF/TATF)			7			7			7
Subtotal, Fleet Sup.			33			33			33
Total, General Purpose			581			592			605
Total, All Ships			623			635			649

APPENDIX B. OPTION II: NAVY FORCE OBJECTIVES--SHIPS IN FLEET BY 1996 AND AUTHORIZED BY 1992

This appendix contains tables showing details of an illustrative shipbuilding program for Option II (see Table B-1) and a year-by-year breakdown of the force structure that would result from that building program (see Table B-2) taking into account the structure of the current fleet and assumed retirements through 1992. In this option, the objective is to achieve the Navy's force level goals by the end of 1996. In developing the force structure projections, assumptions about years of service until ship retirement (from commissioning date) and building time (from authorization to delivery) are as follows:

Retirement Assumptions

50 Years
- Aircraft Carriers (CV/CVN)

40 Years
- Destroyer Tenders (AD)
- Submarine Tenders (AS)
- Repair Ships (AR)
- Fleet Oilers (AO/TAO)
- Salvage Ship (ARS)
- Submarine Rescue Ship (ASR)
- Fleet Tug (ATF/TATF)

30 Years
- All others

Building Time Assumptions

- Aircraft Carriers (CVN)--8 years
- Ballistic Missile Submarine (SSBN)--6 Years
- Nuclear Powered Guided Missile Cruiser (CGN)--5 years
- Nuclear Powered Attack Submarine (SSN)--5 years
- All others--4 years

Under these assumptions, ships actually in the fleet by 1996 must be authorized no later than 1992.

Certain types of reserve and support ships, which are not included in the Navy's current ship counting methodology, are not included in these listings.

TABLE B-1. ILLUSTRATIVE SHIPBUILDING PROGRAM FOR OPTION II: NAVY FORCE OBJECTIVES--SHIPS IN FLEET BY 1996 AND AUTHORIZED BY 1992 (By fiscal year, costs in billions of fiscal year 1983 dollars)

Ship Type	1983		1984		1985		1986		1987	
	Ships	Cost	Ships	Cost	Ships	Cost	Ships	Cost	Ships	Cost
Strategic										
SSBN (Poseidon)	--	--	--	--	--	--	--	--	--	--
SSBN (Trident)	1	1.4	1	1.4	1	1.4	1	1.4	1	1.4
General Purpose										
Combatants										
Aircraft carrier (CVN)	--	--	1	3.5	--	--	1	3.5	--	--
Aircraft carrier (CV)	--	--	--	--	--	--	--	--	--	--
Battleship (BB)	1	0.45	1	0.45	1	0.45	--	--	--	--
Cruiser (CGN)	--	--	--	--	1	2.15	--	--	3	5.25
Cruiser (CG)	4	4.55	4	4.55	4	4.55	8	9.1	--	--
Destroyer (DDG)	--	--	1	1.25	--	--	--	--	7	5.6
Destroyer (DD)	2	1.0	2	1.0	2	1.0	--	--	--	--
Frigate (FFG)	--	--	--	--	--	--	--	--	--	--
Frigate (FF)	--	--	--	--	--	--	--	--	--	--
Submarine (SSN)	2	1.4	1	0.7	2	1.4	1	0.7	2	1.4
Submarine (SS)	--	--	--	--	--	--	--	--	--	--
Small combatant (PG/PHM)	--	--	--	--	--	--	--	--	--	--
Amphibious Ships										
Helo assault ship (LHA/LHD)	--	--	--	--	1	1.3	--	--	1	1.0
Dock transport (LPD)	--	--	--	--	--	--	--	--	1	0.7
Helo transport ship (LPH)	--	--	--	--	--	--	--	--	--	--
Landing ship dock (LSD)	3	1.2	4	1.6	3	1.2	4	1.6	--	--
Landing ship tank (LST)	--	--	--	--	--	--	--	--	--	--
Command ship (LCC)	--	--	--	--	--	--	--	--	--	--
Assault transport (LKA)	--	--	--	--	--	--	--	--	--	--
Mine Warefare Ships										
Ocean minesweeper (MSO)	--	--	--	--	--	--	--	--	--	--
Mine warfare ship (MCM)	6	0.6	6	0.6	5	0.5	--	--	--	--
Mine warfare ship (MSH)	--	--	1	0.1	3	0.18	3	0.18	3	0.18
Replenishment Ships										
Station ship (AOE)	--	--	--	--	--	--	--	--	--	--
Station ship (AOR)	--	--	--	--	--	--	--	--	--	--
Oiler (AO/TAO)	3	0.9	2	0.6	3	0.9	2	0.6	3	0.9
Ammo. ship (AE/TAE)	1	0.4	1	0.4	1	0.4	1	0.4	1	0.4
Stores ship (AFS/TAFS)	--	--	--	--	--	--	--	--	--	--
Material Support Ships										
Destroyer tender (AD)	2	0.9	1	0.45	1	0.45	1	0.45	1	0.45
Submarine tender (AS)	1	0.45	1	0.45	1	0.45	1	0.45	--	--
Repair ship (AR)	--	--	--	--	--	--	--	--	--	--
Fleet Support Ships										
Surveillance ship (AGOS)	--	--	--	--	--	--	1	0.1	2	0.2
Salvage ship (ARS)	1	0.1	1	0.1	--	--	--	--	--	--
Rescue ship (ASR)	--	--	--	--	--	--	--	--	--	--
Salvage/rescue ship (ATS)	--	--	--	--	--	--	--	--	--	--
Fleet tug (ATF/TATF)	--	--	--	--	--	--	--	--	--	--
Total, All Ships	27	13.35	28	17.15	29	16.33	24	18.48	25	17.48

(continued)

TABLE B-1. (Continued)

1988		1989		1990		1991		1992		Total Type	Total Type Cost	Percent of Total Cost, All Ships
Ships	Cost	Ships	Cost	Ships	Cost	Ships	Cost	Ships	Cost			
--	--	--	--	--	--	--	--	--	--	--	--	
1	1.4	1	1.4	1	1.4	1	1.4	1	1.4	10	14.0	8
1	3.5	--	--	1	3.5	--	--	1	3.5	5	17.5	10
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	3	1.35	
2	3.5	3	5.25	2	3.5	3	5.25	2	3.5	16	28.4	
--	--	--	--	--	--	--	--	--	--	20	22.75	53
6	4.8	8	6.4	6	4.8	8	6.4	6	4.8	42	34.05	
--	--	--	--	--	--	--	--	--	--	6	3.0	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
1	0.7	2	1.4	1	0.7	2	1.4	2	1.4	16	11.2	7
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	7	7.3	
--	--	1	0.5	1	0.5	1	0.5	1	0.5	5	2.7	
--	--	--	--	--	--	--	--	--	--	--	--	9
--	--	--	--	--	--	--	--	--	--	14	5.6	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	17	1.7	2
3	0.18	--	--	--	--	--	--	--	--	13	0.75	
1	0.7	1	0.5	1	0.5	1	0.5	1	0.5	5	2.7	
--	--	--	--	--	--	--	--	--	--	--	--	
2	0.6	3	0.9	2	0.6	3	0.9	--	--	23	6.9	8
1	0.4	1	0.4	1	0.4	--	--	--	--	8	3.2	
--	--	--	--	1	0.25	--	--	1	0.5	2	0.75	
1	0.45	1	0.45	1	0.45	--	--	--	--	9	4.05	3
--	--	--	--	--	--	--	--	--	--	4	1.8	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	3	0.3	< 1
--	--	--	--	--	--	--	--	--	--	2	0.2	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
20	17.23	22	18.20	19	17.60	20	17.35	16	17.10	230	170.27	

TABLE B-2. ILLUSTRATIVE FORCE STRUCTURE FOR OPTION II: NAVY FORCE OBJECTIVES--SHIPS IN FLEET BY 1996 AND AUTHORIZED BY 1992 (By fiscal year)

Ship Type	1981 End	1982 Retire	1982 Add	1982 End	1983 Retire	1983 Add	1983 End	1984 Retire	1984 Add	1984 End	1985 Retire	1985 Add	1985 End
Strategic													
SSBN (Poseidon)	34	3		31			31			31			31
SSBN (Trident)	1		1	2		1	3		1	4		2	6
Total, Strategic	35			33			34			35			37
General Purpose													
Combatants													
Aircraft carrier (CVN)	3	0	1	4			4			4			4
Aircraft carrier (CV)	9			9			9			9			9
Battleship (BB)	0			0		1	1		1	2		1	3
Cruiser (CGN)	9			9			9			9			9
Cruiser (CG)	18			18		1	19		1	20		1	21
Destroyer (DDG)	41			41			41			41			41
Destroyer (DD)	44			44		1	45			45			45
Frigate (FFG)	22		8	30		10	40		5	45		5	50
Frigate (FF)	59			59			59			59			59
Submarine (SSN)	86		6	92		5	97		4	101		2	103
Submarine (SS)	5			5			5			5			5
Small combat (PG/PHM)	5	2	3	6			6			6			6
Subtotal, Combatants	301			317			335			346			355
Amphibious Ships													
Helo assault ship (LHA/LHD)	5			5			5			5			5
Dock transport (LPD)	13			13			13			13			13
Helo transport ship (LPH)	7			7			7			7			7
Landing ship dock (LSD)	13			13			13	1	1	13	3		10
Landing ship tank (LST)	20			20			20			20			20
Command ship (LCC)	2			2			2			2			2
Assault transport (LKA)	5			5			5			5			5
Subtotal, Amphibious	65			65			65			65			62
Mine Warfare Ships													
Ocean minesweeper (MSO)	25	4	0	21			21	11		10	6		4
Mine warfare ship (MCM)	0			0			0			0			0
Mine warfare ship (MSH)	0			0			0			0			0
Subtotal, Mine Warfare	25			21			21			10			4
Replenishment Ships													
Station ship (AOE)	4			4			4			4			4
Station ship (AOR)	7			7			7			7			7
Oiler (AO/TAO)	19	1	2	20			20	2		18	3		15
Ammo. ship (AE/TAE)	13			13			13			13			13
Stores ship (AFS/TAFS)	10			10			10			10	1		9
Subtotal, Replenishment	53			54			54			52			48
Material Support Ships													
Destroyer tender (AD)	9	1	1	9	2	1	8	2		6			6
Submarine tender (AS)	13			13	1		12	1		11	1		10
Repair ship (AR)	4			4	1		3	1		2	2		0
Subtotal, Material Sup.	26			26			23			19			16
Fleet Support Ships													
Surveillance ship (TAGOS)	0			0		3	3		5	8		4	12
Salvage ship (ARS)	7			7			7			7		1	8
Rescue ship (ASR)	6			6	1		5			5			5
Salvage/rescue ship (ATS)	3			3			3			3			3
Fleet tug (ATF/TATF)	14			14			14	4		10	3		7
Subtotal, Fleet Sup.	30			30			32			33			35
Total, General Purpose	500			513			530			525			520
Total, All Ships	535			546			564			560			557

(continued)

RETIREMENT ASSUMPTIONS: 50 years--CV/CVN; 40 years--AD, AS, AR, AO/TAO, ARS, ASR, ATF; 30 years--all others .

TABLE B-2. (Continued)

Ship Type	1986 Re-tire	1986 Add	1986 End	1987 Re-tire	1987 Add	1987 End	1988 Re-tire	1988 Add	1988 End	1989 Re-tire	1989 Add	1989 End
Strategic												
SSBN (Poseidon)			31			31			31			31
SSBN (Trident)		1	7		2	9			9		1	10
Total, Strategic			38			40			40			41
General Purpose												
Combatants												
Aircraft carrier (CVN)			4			4		1	5			5
Aircraft carrier (CV)			9			9			9			9
Battleship (BB)		1	4			4			4			4
Cruiser (CGN)			9			9			9			9
Cruiser (CG)		4	25		4	29		4	33		4	37
Destroyer (DDG)	1		40	1		39			39	1	1	39
Destroyer (DD)	2		43	4	2	41	4	2	39	4	2	37
Frigate (FFG)		4	54			54			54			54
Frigate (FF)			59			59			59			59
Submarine (SSN)		4	107	1	3	109	2	2	109	2	1	108
Submarine (SS)			5	1		4	1		3	2		1
Small combat (PG/PHM)			6			6			6			6
Subtotal, Combatants			365			367			369			368
Amphibious Ships												
Helo assault ship (LHA/LHD)			5			5			5		1	6
Dock transport (LPD)			13			13			13			13
Helo transport ship (LPH)			7			7			7			7
Landing ship dock (LSD)	2	1	9	2	3	10		4	14		3	17
Landing ship tank (LST)			20			20			20			20
Command ship (LCC)			2			2			2			2
Assault transport (LKA)			5			5			5			5
Subtotal, Amphibious			61			62			66			70
Mine Warfare Ships												
Ocean minesweeper (MSO)	2		2	1		1			1	1		0
Mine warfare ship (MCM)		1	1		6	7		6	13		5	18
Mine Warfare ship (MSH)			0			0		1	1		3	4
Subtotal, Mine Warfare			3			8			15			22
Replenishment Ships												
Station ship (AOE)			4			4			4			4
Station ship (AOR)			7			7			7			7
Oiler (AO/TAO)	4	1	12		3	15		2	17		3	20
Ammo. ship (AE/TAE)			13	2	1	12		1	13	2	1	12
Stores ship (AFS/TAFS)			9			9			9			9
Subtotal, Replenishment			45			47			50			52
Material Support Ships												
Destroyer tender (AD)			6		2	8		1	9		1	10
Submarine tender (AS)	1		9		1	10		1	11		1	12
Repair ship (AR)			0			0			0			0
Subtotal, Material Sup.			15			18			20			22
Fleet Support Ships												
Surveillance ship (TAGOS)			12			12			12			12
Salvage ship (ARS)	3	2	7	3	1	5		1	6			6
Rescue ship (ASR)	2		3	1		2			2			2
Salvage/rescue ship (ATS)			3			3			3			3
Fleet tug (ATF/TATF)			7			7			7			7
Subtotal, Fleet Sup.			32			29			30			30
Total, General Purpose			521			531			550			564
Total, All Ships			559			571			590			605

(continued

BUILDING TIME ASSUMPTIONS: CVN--8 years; SSBN--6 years; CGN--5 years; SSN--5 years; all others--4 years .

TABLE B-2. (Continued)

Ship Type	1990 Re-tire	1990 Add	1990 End	1991 Re-tire	1991 Add	1991 End	1992 Re-tire	1992 Add	1992 End	1993 Re-tire	1993 Add	1993 End
Strategic												
SSBN (Poseidon)			31			31			31	6		25
SSBN (Trident)		1	11		1	12		1	13		1	14
Total, Strategic			42			43			44			39
General Purpose												
Combatants												
Aircraft carrier (CVN)			5			5		1	6			6
Aircraft carrier (CV)			9			9			9			9
Battleship (BB)			4			4			4			4
Cruiser (CGN)		1	10	1		9	1	3	11		2	13
Cruiser (CG)		8	45			45	1		44	4		40
Destroyer (DDG)	6		33	9	7	31	9	6	28	5	8	31
Destroyer (DD)			37			37			37			37
Frigate (FFG)			54			54			54			54
Frigate (FF)			59			59			59	1		58
Submarine (SSN)	4	2	106	6	1	101	3	2	100	3	1	98
Submarine (SS)	1		0			0			0			0
Small combat (PG/PHM)			6			6			6			6
Subtotal, Combatants			368			360			358			356
Amphibious Ships												
Helo assault ship (LHA/LHD)			6		1	7		1	8		1	9
Dock transport (LPD)			13		1	14	1		13	1	1	13
Helo transport ship (LPH)			7	1		6	1		5	1		4
Landing ship dock (LSD)		4	21			21			21			21
Landing ship tank (LST)			20			20			20			20
Command ship (LCC)			2			2			2			2
Assault transport (LKA)			5			5			5			5
Subtotal, Amphibious			74			75			74			74
Mine Warfare Ships												
Ocean minesweeper (MSO)			0			0			0			0
Mine warfare ship (MCM)			18			18			18			18
Mine warfare ship (MSH)		3	7		3	10		3	13			13
Subtotal, Mine Warfare			25			28			31			31
Replenishment Ships												
Station ship (AOE)			4			4		1	5		1	6
Station ship (AOR)			7			7			7			7
Oiler (AO/TAO)		2	22		3	25		2	27		3	30
Ammo. ship (AE/TAE)	1	1	12		1	13		1	14		1	15
Stores ship (AFS/TAFS)			9			9			9			9
Subtotal, Replenishment			54			58			62			67
Material Support Ships												
Destroyer tender (AD)	1	1	10		1	11		1	12		1	13
Submarine tender (AS)		1	13			13			13			13
Repair ship (AR)			0			0			0			0
Subtotal, Material Sup.			23			24			25			26
Fleet Support Ships												
Surveillance ship (TAGOS)		1	13		2	15			15			15
Salvage ship (ARS)			6			6			6			6
Sub, rescue ship (ASR)			2			2			2			2
Salvage/rescue ship (ATS)			3			3			3			3
Fleet tug (ATF/TATF)			7			7			7			7
Subtotal, Fleet Sup.			31			33			33			33
Total, General Purpose			575			578			583			587
Total, All Ships			617			621			627			626

(continued

TABLE B-2. (Continued)

Ship Type	1994 Re-tire	1994 Add	1994 End	1995 Re-tire	1995 Add	1995 End	1996 Re-tire	1996 Add	1996 End
Strategic									
SSBN (Poseidon)	13		12	4		8	7		1
SSBN (Trident)		1	15		1	16		1	17
Total, Strategic			27			24			18
General Purpose									
Combatants									
Aircraft carrier (CVN)		1	7			7		1	8
Aircraft carrier (CV)			9	1		8	1		7
Battleship (BB)			4			4			4
Cruiser (CGN)		3	16		2	18		3	21
Cruiser (CG)	4		36	2		34	3		31
Destroyer (DDG)	5	6	32		8	40		6	46
Destroyer (DD)			37			37			37
Frigate (FFG)			54			54	1		53
Frigate (FF)	1		57	4		53	2		51
Submarine (SSN)	2	2	98	2	1	97	1	2	98
Submarine (SS)			0			0			0
Small combat (PG/PHM)			6			6			6
Subtotal, Combatants			356			358			362
Amphibious Ships									
Helo assault ship (LHA/LHD)		1	10		1	11		1	12
Dock transport (LPD)		1	14	2	1	13	1	1	13
Helo transport ship (LPH)			4	1		3	1		2
Landing ship dock (LSD)			21			21			21
Landing ship tank (LST)			20			20			20
Command ship (LCC)			2			2			2
Assault transport (LKA)			5			5			5
Subtotal, Amphibious			76			75			75
Mine Warfare Ships									
Ocean minesweeper (MSO)			0			0			0
Mine warfare ship (MCM)			18			18			18
Mine warfare ship (MSH)			13			13			13
Subtotal, Mine Warfare			31			31			31
Replenishment Ships									
Station ship (AOE)	1	1	6		1	7		1	8
Station ship (AOR)			7			7			7
Oiler (AO/TAO)	1	2	31	3	3	31	2		29
Ammo. ship (AE/TAE)		1	16			16			16
Stores ship (AFS/TAFS)	2	1	8			8		1	9
Subtotal, Replenishment			68			69			69
Material Support Ships									
Destroyer tender (AD)		1	14			14			14
Submarine tender (AS)			13			13			13
Repair ship (AR)			0			0			0
Subtotal, Material Sup.			27			27			27
Fleet Support Ships									
Surveillance ship (TAGOS)			15			15			15
Salvage ship (ARS)			6			6			6
Rescue ship (ASR)			2			2			2
Salvage/rescue ship (ATS)			3			3			3
Fleet tug (ATF/TATF)			7			7			7
Subtotal, Fleet Sup.			33			33			33
Total, General Purpose			591			593			597
Total, All Ships			618			617			615

APPENDIX C. OPTION III: REDUCED FORCE OBJECTIVES--SHIPS IN FLEET BY 1996 AND AUTHORIZED BY 1992

This appendix contains tables giving details of an illustrative shipbuilding program for Option III (see Table C-1) and a year-by-year breakdown of the force structure that would result from that building program (see Table C-2), taking into account the structure of the current fleet and assumed retirements through 1996. In this option, shipbuilding budgets are constrained to about the current level and a mix of ship types consistent with current planning is procured. This results in force levels significantly lower than Navy objectives. In developing the force structure projections, assumptions about years of service until ship retirement (from commissioning date) and building time (from authorization to delivery) are as follows:

Retirement Assumptions	Building Time Assumptions
50 Years	Aircraft Carriers (CVN)--8 years
Aircraft Carriers (CV/CVN)	Ballistic Missile Submarine (SSBN)--6 Years
40 Years	Nuclear Powered Guided Missile Cruiser (CGN)--5 years
Destroyer Tenders (AD)	Nuclear Powered Attack Submarine (SSN)--5 years
Submarine Tenders (AS)	All others--4 years
Repair Ships (AR)	
Fleet Oilers (AO/TAO)	
Salvage Ship (ARS)	
Submarine Rescue Ship (ASR)	
Fleet Tug (ATF/TATF)	
30 Years	
All others	

Under these assumptions, ships actually in the fleet by 1996 must be authorized no later than 1992.

Certain types of reserve and support ships, which are not included in the Navy's current ship counting methodology, are not included in these tables.

TABLE C-1. ILLUSTRATIVE SHIPBUILDING PROGRAM FOR OPTION III: REDUCED FORCE LEVEL OBJECTIVES--SHIPS IN FLEET BY 1996 AND AUTHORIZED BY 1992 (By fiscal year, costs in billions of fiscal year 1983 dollars)

Ship Type	1983		1984		1985		1986		1987	
	Ships	Cost	Ships	Cost	Ships	Cost	Ships	Cost	Ships	Cost
Strategic										
SSBN (Poseidon)	--	--	--	--	--	--	--	--	--	--
SSBN (Trident)	1	1.4	1	1.4	1	1.4	1	1.4	1	1.40
General Purpose										
Combatants										
Aircraft carrier (CVN)	--	--	--	--	--	--	--	--	--	--
Aircraft carrier (CV)	--	--	--	--	--	--	--	--	--	--
Battleship (BB)	1	0.45	1	0.45	1	0.45	--	--	--	--
Cruiser (CGN)	--	--	--	--	--	--	--	--	--	--
Cruiser (CG)	4	4.56	4	4.56	4	4.56	4	4.56	2	2.28
Destroyer (DDGX)	--	--	--	--	1	1.25	--	--	5	4.00
Destroyer (DD)	--	--	--	--	--	--	--	--	--	--
Frigate (FFG)	--	--	--	--	--	--	--	--	--	--
Frigate (FF)	--	--	--	--	--	--	--	--	--	--
Submarine (SSN)	1	0.7	1	0.7	--	--	1	0.7	--	--
Submarine (SS)	--	--	--	--	--	--	--	--	--	--
Small combatant (PG/PHM)	--	--	--	--	--	--	--	--	--	--
Amphibious Ships										
Helo assault ship (LHA/LHD)	--	--	1	1.3	--	--	1	1.0	--	--
Dock transport (LPD)	--	--	--	--	--	--	--	--	1	1.00
Helo transport ship (LPH)	--	--	--	--	--	--	--	--	--	--
Landing ship dock (LSD)	2	0.8	1	0.4	2	0.8	1	0.4	1	0.4
Landing ship tank (LST)	--	--	--	--	--	--	--	--	--	--
Command ship (LCC)	--	--	--	--	--	--	--	--	--	--
Assault transport (LKA)	--	--	--	--	--	--	--	--	--	--
Mine Warefare Ships										
Ocean minesweeper (MSO)	--	--	--	--	--	--	--	--	--	--
Mine warfare ship (MCM)	--	--	3	0.3	3	0.3	3	0.3	3	0.3
Mine warfare ship (MSH)	--	--	--	--	1	0.1	--	--	3	0.18
Replenishment Ships										
Station ship (AOE)	--	--	--	--	--	--	--	--	--	--
Station ship (AOR)	--	--	--	--	--	--	--	--	--	--
Oiler (AO/TAO)	1	0.3	2	0.6	1	0.3	2	0.6	1	0.3
Ammo. ship (AE/TAE)	1	0.4	1	0.4	1	0.4	1	0.4	--	--
Stores ship (AFS/TAFS)	--	--	--	--	--	--	--	--	--	--
Material Support Ships										
Destroyer tender (AD)	1	0.45	--	--	1	0.45	--	--	1	0.45
Submarine tender (AS)	--	--	1	0.45	--	--	1	0.45	--	--
Repair ship (AR)	--	--	--	--	--	--	--	--	--	--
Fleet Support Ships										
Surveillance ship (AGOS)	--	--	--	--	--	--	--	--	--	--
Salvage ship (ARS)	--	--	--	--	--	--	--	--	--	--
Sub, rescue ship (ASR)	--	--	--	--	--	--	--	--	--	--
Salvage/rescue ship (ATS)	--	--	--	--	--	--	--	--	--	--
Fleet tug (ATF/TATF)	--	--	--	--	--	--	--	--	--	--
Total, All Ships	12	9.06	16	10.56	16	10.01	15	9.81	18	10.31

(continued)

TABLE C-1 (Continued)

1988		1989		1990		1991		1992		Total Type	Total Type Cost	Percent of Total Cost, All Ships
Ships	Cost	Ships	Cost	Ships	Cost	Ships	Cost	Ships	Cost			
--	--	--	--	--	--	--	--	--	--	--	--	
1	1.4	1	1.4	1	1.4	1	1.4	1	1.4	10	14.0	14
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	3	1.35	
--	--	--	--	--	--	--	--	--	--	--	--	
2	2.28	--	--	--	--	--	--	--	--	20	22.8	57
6	4.80	6	4.80	7	5.6	7	5.6	7	5.6	39	31.6	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	1	0.7	1	0.7	1	0.7	--	--	6	4.2	4
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
1	1.0	--	--	1	1.0	--	--	--	--	4	4.3	
--	--	1	0.75	--	--	1	0.75	1	0.75	4	3.25	11
--	--	--	--	--	--	--	--	--	--	--	--	
1	0.4	--	--	--	--	--	--	--	--	8	3.2	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	12	1.20	2
2	0.12	3	0.18	3	0.18	--	--	--	--	12	0.76	
--	--	--	--	--	--	--	--	1	0.7	1	0.7	
--	--	--	--	--	--	--	--	--	--	--	--	
2	0.6	1	0.3	2	0.6	1	0.3	2	0.6	15	4.5	7
--	--	--	--	--	--	--	--	--	--	4	1.6	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	1	0.45	--	--	--	--	--	--	4	1.8	4
1	0.45	--	--	1	0.45	--	--	--	--	4	1.8	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
16	11.05	14	8.58	16	9.93	11	8.75	12	9.05	146	97.11	

TABLE C-2. ILLUSTRATIVE FORCE STRUCTURE FOR OPTION III: REDUCED FORCE LEVEL OBJECTIVES--SHIPS IN FLEET BY 1996 AND AUTHORIZED BY 1992 (By fiscal year)

Ship Type	1981 End	1982 Re-tire	1982 Add	1982 End	1983 Re-tire	1983 Add	1983 End	1984 Re-tire	1984 Add	1984 End	1985 Re-tire	1985 Add	1985 End
Strategic													
SSBN (Poseidon)	34	3		31			31			31			31
SSBN (Trident)	1		1	2		1	3		1	4		2	6
Total, Strategic	35			33			34			35			37
General Purpose													
Combatants													
Aircraft carrier (CVN)	3		1	4			4			4			4
Aircraft carrier (CV)	9			9			9			9			9
Battleship (BB)	0			0		1	1		1	2		1	3
Cruiser (CGN)	9			9			9			9			9
Cruiser (CG)	18			18		1	19		1	20		1	21
Destroyer (DDG)	41			41			41			41			41
Destroyer (DD)	44			44		1	45			45			45
Frigate (FFG)	22		8	30		10	40		5	45		5	50
Frigate (FF)	59			59			59			59			59
Submarine (SSN)	86		6	92		5	97		4	101		2	103
Submarine (SS)	5			5			5			5			5
Small combat (PG/PHM)	5	2	3	6			6			6			6
Subtotal, combatants	301			317			335			346			355
Amphibious Ships													
Helo assault ship (LHA/LHD)	5			5			5			5			5
Dock transport (LPD)	13			13			13			13			13
Helo transport ship (LPH)	7			7			7			7			7
Landing ship dock (LSD)	13			13			13	1	1	13	3		10
Landing ship tank (LST)	20			20			20			20			20
Command ship (LCC)	2			2			2			2			2
Assault transport (LKA)	5			5			5			5			5
Subtotal, Amphibious	65			65			65			65			62
Mine Warfare Ships													
Ocean minesweeper (MSO)	25	4		21			21	11		10	6		4
Mine warfare ship (MCM)	0			0			0			0			0
Mine warfare ship (MSH)	0			0			0			0			0
Subtotal, Mine Warfare	25			21			21			10			4
Replenishment Ships													
Station ship (AOE)	4			4			4			4			4
Station ship (AOR)	7			7			7			7			7
Oiler (AO/TAO)	19	1	2	20			20	2		18	3		15
Ammo. ship (AE/TAE)	13			13			13			13			13
Stores ship (AFS/TAFS)	10			10			10			10	1		9
Subtotal, Replenishment	53			54			54			52			48
Material Support Ships													
Destroyer tender (AD)	9	1	1	9	2	1	8	2		6			6
Submarine tender (AS)	13			13	1		12	1		11	1		10
Repair ship (AR)	4			4	1		3	1		2	2		0
Subtotal, Material Sup.	26			26			23			19			16
Fleet Support Ships													
Surveillance ship (TAGOS)	0			0		3	3		5	8		4	12
Salvage ship (ARS)	7			7			7			7		1	8
Rescue ship (ASR)	6			6	1		5			5			5
Salvage/rescue ship (ATS)	3			3			3			3			3
Fleet tug (ATF/TATF)	14			14			14	4		10	3		7
Subtotal, Fleet Sup.	30			30			32			33			35
Total, General Purpose	500			513			532			525			520
Total, All Ships	535			546			564			560			557

(Continued)

RETIREMENT ASSUMPTIONS: 50 years--CV/CVN; 40 years--AD, AS, AR, AO/TAO, ARS, ASR, ATF; 30 years--all others.

TABLE C-2. (Continued)

Ship Type	1986 Re-tire	1986 Add	1986 End	1987 Re-tire	1987 Add	1987 End	1988 Re-tire	1988 Add	1988 End	1989 Re-tire	1989 Add	1989 End
Strategic												
SSBN (Poseidon)			31			31			31			31
SSBN (Trident)		1	7		2	9			9		1	10
Total, Strategic			38			40			40			41
General Purpose												
Combatants												
Aircraft carrier (CVN)			4			4		1	5			5
Aircraft carrier (CV)			9			9			9			9
Battleship (BB)		1	4			4			4			4
Cruiser (CGN)			9			9			9			9
Cruiser (CG)		4	25		4	29		4	33		4	37
Destroyer (DDG)	1		40	1		39			39	1		38
Destroyer (DD)	2		43	4		39	4		35	4		31
Frigate (FFG)		4	54			54			54			54
Frigate (FF)			59			59			59			59
Submarine (SSN)		4	107	1	3	109	2	1	108	2	1	107
Submarine (SS)			5	1		4	1		3	2		1
Small combat (PG/PHM)			6			6			6			6
Subtotal, Combatants			365			365			364			360
Amphibious Ships												
Helo assault ship (LHA/LHD)			5			5		1	6			6
Dock transport (LPD)			13			13			13			13
Helo transport ship (LPH)			7			7			7			7
Landing ship dock (LSD)	2	1	9	2	2	9		1	10		2	12
Landing ship tank (LST)			20			20			20			20
Command ship (LCC)			2			2			2			2
Assault transport (LKA)			5			5			5			5
Subtotal, Amphibious			61			61			63			65
Mine Warfare Ships												
Ocean minesweeper (MSO)	2		2	1		1			1	1		0
Mine warfare ship (MCM)		1	1			1		3	4		3	7
Mine warfare ship (MSH)			0			0			0		1	1
Subtotal, Mine Warfare			3			2			5			8
Replenishment Ships												
Station ship (AOE)			4			4			4			4
Station ship (AOR)			7			7			7			7
Oiler (AO/TAO)	4	1	12		1	13		2	15		1	16
Ammo. ship (AE/TAE)			13	2	1	12		1	13	2	1	12
Stores ship (AFS/TAFS)			9			9			9			9
Subtotal, Replenishment			45			45			48			48
Material Support Ships												
Destroyer tender (AD)			6		1	7			7		1	8
Submarine tender (AS)	1		9			9		1	10			10
Repair ship (AR)			0			0			0			0
Subtotal, Material Sup.			15			16			17			18
Fleet Support Ships												
Surveillance ship (TAGOS)			12			12			12			12
Salvage ship (ARS)	3	2	7	3		4			4			4
Rescue ship (ASR)	2		2	1		2			2			2
Salvage/rescue ship (ATS)			3			3			3			3
Fleet tug (ATF/TATF)			7			7			7			7
Subtotal, Fleet Sup.			32			28			28			28
Total, General Purpose			521			517			525			527
Total, All Ships			559			557			565			568

(continued)

BUILDING TIME ASSUMPTIONS: CVN--8 years, SSBN--6 years, CGN--5 years, SSN--5 years, all others--4 years .

TABLE C-2. (Continued)

Ship Type	1990 Re-tire	1990 Add	1990 End	1991 Re-tire	1991 Add	1991 End	1992 Re-tire	1992 Add	1992 End	1993 Re-tire	1993 Add	1993 End
Strategic												
SSBN (Poseidon)			31			31			31	6		25
SSBN (Trident)		1	11		1	12		1	13		1	14
Total, Strategic			42			43			44			39
General Purpose												
Combatants												
Aircraft carrier (CVN)			5			5			5			6
Aircraft carrier (CV)			9			9			9			9
Battleship (BB)			4			4			4			4
Cruiser (CGN)			9	1		8	1		7			7
Cruiser (CG)		4	41		2	43	1	2	44	4		40
Destroyer (DDG)	6		32	9	5	28	9	6	25	5	6	26
Destroyer (DD)			31			31			31			31
Frigate (FFG)			54			54			54			54
Frigate (FF)			59			59			59	1		58
Submarine (SSN)	4		103	6	1	98	3		95	3		92
Submarine (SS)	1		0			0			0			0
Small combat (PC/PHM)			6			6			6			6
Subtotal, Combatants			353			345			339			332
Amphibious Ships												
Helo assault ship (LHA/LHD)		1	7			7		1	8			8
Dock transport (LPD)			13		1	14	1		13	1	1	13
Helo transport Ship (LPH)			7	1		6	1		5	1		4
Landing ship dock (LSD)		1	13		1	14		1	15			15
Landing ship tank (LST)			20			20			20			20
Command ship (LCC)			2			2			2			2
Assault transport (LKA)			5			5			5			5
Subtotal, Amphibious			67			68			68			67
Mine Warfare Ships												
Ocean minesweeper (MSO)			0			0			0			0
Mine warfare ship (MCM)		1	13			13			13			13
Mine warfare ship (MSH)			8			8			8		3	8
Subtotal, Mine Warfare			21			21			21			21
Replenishment Ships												
Station ship (AOE)			4			4			4			4
Station ship (AOR)			7			7			7			7
Oiler (AO/TAO)		2	18			18			18		1	19
Ammo. ship (AE/TAE)	1	1	12			12			12			12
Stores ship (AFS/TAFS)			9			9			9			9
Subtotal, Replenishment			50			50			50			51
Material Support Ships												
Destroyer tender (AD)	1		7	1		6			6		1	7
Submarine tender (AS)		1	11			11		1	12			12
Repair ship (AR)			0			0			0			0
Subtotal, Material Sup.			18			17			18			19
Fleet Support Ships												
Surveillance ship (TAGOS)			12			12			12			12
Salvage ship (ARS)			4			4			4			4
Rescue ship (ASR)			2			2			2			2
Salvage/rescue ship (ATS)			3			3			3			3
Fleet tug (ATF/TATF)			7			7			7			7
Subtotal, Fleet Sup.			28			28			28			28
Total, General Purpose			527			526			527			524
Total, All Ships			569			571			571			563

(continued)

TABLE C-2. (Continued)

Ship Type	1994 Re-tire	1994 Add	1994 End	1995 Re-tire	1995 Add	1995 End	1996 Re-tire	1996 Add	1996 End
Strategic									
SSBN (Poseidon)	13		12	4		8	7		1
SSBN (Trident)		1	15		1	16		1	17
Total, Strategic			27			24			18
General Purpose									
Combatants									
Aircraft carrier (CVN)			5			5			5
Aircraft carrier (CV)			9	1		8	1		7
Battleship (BB)			4			4			4
Cruiser (CGN)			7			7			7
Cruiser (CG)	4		36	2		34	3		31
Destroyer (DDG)	5	7	28		7	35		7	42
Destroyer (DD)			31			31			31
Frigate (FFG)			54			54	1		53
Frigate (FF)	1		57	4		53	2		51
Submarine (SSN)	2	1	91	2	1	90	1	1	90
Submarine (SS)			0			0			0
Small combat (PG/PHM)			6			6			6
Subtotal, Combatants			328			327			327
Amphibious Ships									
Helo assault ship (LHA/LHD)		1	9			9			9
Dock transport (LPD)			13	2	1	12	1	1	12
Helo transport ship (LPH)			4	1		3	1		2
Landing ship dock (LSD)			15			15			15
Landing ship tank (LST)			20			20			20
Command ship (LCC)			2			2			2
Assault transport (LKA)			5			5			5
Subtotal, Amphibious			68			66			65
Mine Warfare Ships									
Ocean minesweeper (MSO)			0			0			0
Mine warfare ship (MCM)			13			13			13
Mine warfare ship (MSH)		3	12			12			12
Subtotal, Mine Warfare			25			25			25
Replenishment Ships									
Station ship (AOE)	1		3			3		1	4
Station ship (AOR)			7			7			7
Oiler (AO/TAO)	1	2	23	3	1	21	2	2	21
Ammo. ship (AE/TAE)			12			12			12
Stores ship (AFS/TAFS)	2		7			7			7
Subtotal, Replenishment			52			50			51
Material Support Ships									
Destroyer tender (AD)			9			9			9
Submarine tender (AS)		1	13			13			13
Repair ship (AR)			0			0			0
Subtotal, Material Sup.			22			22			22
Fleet Support Ships									
Surveillance ship (TAGOS)			12			12			12
Salvage ship (ARS)			4			4			4
Rescue ship (ASR)			2			2			2
Salvage/rescue ship (ATS)			3			3			3
Fleet tug (ATF/TATF)			7			7			7
Subtotal, Fleet Sup.			28			28			28
Total, General Purpose			523			518			518
Total, All Ships			550			542			536

APPENDIX D. OPTION IV: MODIFIED FORCE MIX, EXPANDED FORCE LEVELS--SHIPS IN FLEET BY 1996--AUTHORIZED BY 1992

This appendix contains tables presenting in detail an illustrative shipbuilding program for Option IV (see Table D-1) and a year-by-year breakdown of the force structure that would result from that building program (see Table D-2), taking into account the structure of the current fleet and assumed retirements through 1996. In this option, the objective is to achieve force level goals consistent with Navy objectives by the end of 1996, but to reduce costs by changing the mix of ship types procured. In developing the force structure projections, assumptions about years of service until ship retirement (from commissioning date) and building time (from authorization to delivery) are as follows:

Retirement Assumptions	Building Time Assumptions
50 Years	Aircraft Carriers (CVN)--8 years
Aircraft Carriers (CV/CVN)	Ballistic Missile Submarine (SSBN)--6 Years
40 Years	Nuclear Powered Guided Missile Cruiser (CGN)--5 years
Destroyer Tenders (AD)	Nuclear Powered Attack Submarine (SSN)--5 years
Submarine Tenders (AS)	All others--4 years
Repair Ships (AR)	
Fleet Oilers (AO/TAO)	
Salvage Ship (ARS)	
Submarine Rescue Ship (ASR)	
Fleet Tug (ATF/TATF)	
30 Years	
All others	

Under these assumptions, ships actually in the fleet by 1996 must be authorized no later than 1992.

Certain types of reserve and support ships, which are not included in the Navy's current ship counting methodology, are not included in these tables.

TABLE D-1. ILLUSTRATIVE SHIPBUILDING PROGRAM FOR OPTION IV: MODIFIED FORCE MIX, EXPANDED FORCE LEVELS--SHIPS IN FLEET BY 1996 AND AUTHORIZED BY 1992 (By fiscal year, costs in billions of fiscal year 1983 dollars)

Ship Type	1983		1984		1985		1986		1987	
	Ships	Cost	Ships	Cost	Ships	Cost	Ships	Cost	Ships	Cost
Strategic										
SSBN (Poseidon)	--	--	--	--	--	--	--	--	--	--
SSBN (Trident)	1	1.4	1	1.4	1	1.4	1	1.4	1	1.4
General Purpose										
Combatants										
Aircraft carrier (CVN)	--	--	1	3.5	--	--	--	--	1	3.5
Aircraft carrier (CV)	--	--	--	--	--	--	--	--	--	--
Battleship (BB)	1	0.45	1	0.45	1	0.45	--	--	--	--
V/STOL cruiser (CGV)	--	--	--	--	--	--	--	--	1	1.0
Cruiser (CG)	3	3.42	2	2.28	3	3.42	3	3.42	3	3.42
Destroyer (DDG)	--	--	--	--	--	--	1	0.65	--	--
Destroyer (DD)	--	--	--	--	--	--	--	--	--	--
Frigate (FFG)	--	--	--	--	--	--	--	--	--	--
Frigate (FF)	--	--	--	--	--	--	--	--	--	--
Submarine (SSN)	1	0.7	--	--	1	0.7	--	--	--	--
Submarine (SS)	--	--	1	0.25	--	--	2	0.3	2	0.3
Small combatant (PG/PHM)	--	--	--	--	--	--	--	--	--	--
Amphibious Ships										
Helo assault ship (LHA/LHD)	--	--	--	--	1	1.3	--	--	1	1.0
Dock transport (LPD)	--	--	--	--	--	--	1	0.7	--	--
Helo transport ship (LPH)	--	--	--	--	--	--	--	--	--	--
Landing ship dock (LSD)	4	1.9	3	1.4	3	1.4	4	1.8	--	--
Landing ship tank (LST)	--	--	--	--	--	--	--	--	--	--
Command ship (LCC)	--	--	--	--	--	--	--	--	--	--
Assault transport (LKA)	--	--	--	--	--	--	--	--	--	--
Mine Warefare Ships										
Ocean minesweeper (MSO)	--	--	--	--	--	--	--	--	--	--
Mine warfare ship (MCM)	4	0.4	4	0.4	4	0.4	5	0.5	--	--
Mine warfare ship (MSH)	--	--	--	--	1	0.20	--	--	3	0.33
Replenishment Ships										
Station ship (AOE)	--	--	--	--	--	--	--	--	--	--
Station ship (AOR)	--	--	--	--	--	--	--	--	--	--
Oiler (AO/TAO)	2	0.6	2	0.6	2	0.6	3	0.9	2	0.6
Ammo. ship (AE/TAE)	1	0.4	1	0.4	1	0.4	1	0.4	--	--
Stores ship (AFS/TAFS)	--	--	--	--	--	--	--	--	--	--
Material Support Ships										
Destroyer tender (AD)	1	0.45	--	--	1	0.45	1	0.45	1	0.45
Submarine tender (AS)	--	--	--	--	1	0.45	1	0.45	--	--
Repair ship (AR)	--	--	--	--	--	--	--	--	--	--
Fleet Support Ships										
Surveillance ship (AGOS)	--	--	--	--	--	--	--	--	--	--
Salvage ship (ARS)	--	--	--	--	--	--	--	--	--	--
Rescue ship (ASR)	--	--	--	--	--	--	--	--	--	--
Salvage/rescue ship (ATS)	--	--	--	--	--	--	--	--	--	--
Fleet tug (ATF/TATF)	--	--	--	--	--	--	--	--	--	--
Total, All Ships	18	9.72	16	10.68	20	11.17	23	10.97	15	12.00

(Continued)

TABLE D-1. (Continued)

1988		1989		1990		1991		1992		Total	Total Type	Percent of Total Cost, All
Ships	Cost	Ships	Cost	Ships	Cost	Ships	Cost	Ships	Cost	Type	Cost	Ships
--	--	--	--	--	--	--	--	--	--	--	--	12
1	1.4	1	1.4	1	1.4	1	1.4	1	1.4	10	14.0	
--	--	--	--	1	3.5	--	--	--	--	3	10.5	9
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	3	1.35	
--	--	2	1.5	3	2.25	3	2.25	3	2.25	12	8.25	42
--	--	--	--	--	--	--	--	--	--	14	15.96	
12	4.8	12	4.8	12	4.8	12	4.8	12	4.8	61	24.65	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
1	0.7	1	0.7	--	--	1	0.7	1	0.7	6	4.2	5
2	0.3	3	0.45	--	--	--	--	--	--	10	1.6	
--	--	--	--	--	--	--	--	--	--	--	--	
1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	7	7.3	
1	0.5	1	0.5	--	--	1	0.5	1	0.5	5	2.7	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	14	6.5	14
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	17	1.7	3
3	0.33	3	0.33	3	0.33	--	--	--	--	13	1.52	
1	0.7	1	0.5	1	0.5	1	0.5	1	0.5	5	2.7	
--	--	--	--	--	--	--	--	--	--	--	--	
3	0.9	2	0.6	2	0.6	2	0.6	3	0.9	23	6.9	
1	0.4	1	0.4	--	--	1	0.4	1	0.4	8	3.2	11
--	--	--	--	--	--	1	0.25	1	0.25	2	0.5	
1	0.45	1	0.45	1	0.45	1	0.45	1	0.45	9	4.05	5
--	--	--	--	--	--	1	0.45	1	0.45	4	1.8	
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	3	0.30	--	--	3	0.30	
2	0.20	--	--	--	--	--	--	--	--	2	0.20	
--	--	--	--	--	--	--	--	--	--	--	--	<1
--	--	--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	--	--	
29	11.68	29	12.63	25	14.83	29	13.60	27	13.60	231	120.88	

TABLE D-2. ILLUSTRATIVE FORCE STRUCTURE FOR OPTION IV: MODIFIED FORCE MIX, EXPANDED FORCE LEVELS--SHIPS IN FLEET BY 1996 AND AUTHORIZED BY 1992 (By fiscal year)

Ship Type	1981 End	1982 Re-tire	1982 Add	1982 End	1983 Re-tire	1983 Add	1983 End	1984 Re-tire	1984 Add	1984 End	1985 Re-tire	1985 Add	1985 End
Strategic													
SSBN (Poseidon)	34	3		31			31			31			31
SSBN (Trident)	1		1	2		1	3		1	4		2	6
Total, Strategic	35			33			34			35			37
General Purpose													
Combatants													
Aircraft carrier (CVN)	3		1	4			4			4			4
Aircraft carrier (CV)	9			9			9			9			9
Battleship (BB)	0			0		1	1		1	2		1	3
Cruiser (CGN)	9			9			9			9			9
Cruiser (CG)	18			18		1	19		1	20		1	21
V/STOL cruiser (CGV)	0			0			0			0			0
Destroyer (DDG)	41			41			41			41			41
Destroyer (DD)	44			44		1	45			45			45
Frigate (FFG)	22		8	30		10	40		5	45		5	50
Frigate (FF)	59			59			59			59			59
Submarine (SSN)	86		6	92		5	97		4	101		2	103
Submarine (SS)	5			5			5			5			5
Small combat (PG/PHM)	5	2	3	6			6			6			6
Subtotal, Combatants	301			317			335			346			355
Amphibious Ships													
Helo assault hip (LHA/LHD)	5			5			5			5			5
Dock transport (LPD)	13			13			13			13			13
Helo transport ship (LPH)	7			7			7			7			7
Landing ship dock (LSD)	13			13			13	1	1	13	3		10
Landing ship tank (LST)	20			20			20			20			20
Command ship (LCC)	2			2			2			2			2
Assault transport (LKA)	5			5			5			5			5
Subtotal, Amphibious	65			65			65			65			62
Mine Warfare Ships													
Ocean minesweeper (MSO)	25	4		21			21	11		10	6		4
Mine warfare ship (MCM)	0			0			0			0			0
Mine warfare ship (MSH)	0			0			0			0			0
Subtotal, Mine Warfare	25			21			21			10			4
Replenishment Ships													
Station ship (AOE)	4			4			4			4			4
Station ship (AOR)	7			7			7			7			7
Oiler (AO/TAO)	19	1	2	20			20	2		18	3		15
Ammo. ship (AE/TAE)	13			13			13			13			13
Stores ship (AFS/TAFS)	10			10			10			10	1		9
Subtotal, Replenishment	53			54			54			52			48
Material Support Ships													
Destroyer tender (AD)	9	1	1	9	2	1	8	2		6			6
Submarine tender (AS)	13			13	1		12	1		11	1		10
Repair ship (AR)	4			4	1		3	1		2	2		0
Subtotal, Material Sup.	26			26			23			19			16
Fleet Support Ships													
Surveillance ship (TAGOS)	0			0		3	3		5	8		4	12
Salvage ship (ARS)	7			7			7			7		1	8
Rescue ship (ASR)	6			6	1		5			5			5
Salvage/rescue ship (ATS)	3			3			3			3			3
Fleet tug (ATF/TATF)	14			14			14	4		10	3		7
Subtotal, Fleet Sup.	30			30			32			33			35
Total, General Purpose	500			513			530			525			520
Total, All Ships	535			546			564			560			557

(Continued

RETIREMENT ASSUMPTIONS: 50 years--CV/CVN; 40 years--AD, AS, AR, AO/TAO, ARS, ASR, ATF; 30 years--all others.

TABLE D-2. (Continued)

Ship Type	1986 Re-tire	1986 Add	1986 End	1987 Re-tire	1987 Add	1987 End	1988 Re-tire	1988 Add	1988 End	1989 Re-tire	1989 Add	1989 End
Strategic												
SSBN (Poseidon)			31			31			31			31
SSBN (Trident)		1	7		2	9			9		1	10
Total, Strategic			38			40			40			41
General Purpose												
Combatants												
Aircraft carrier (CVN)			4			4		1	5			5
Aircraft carrier (CV)			9			9			9			9
Battleship (BB)		1	4			4			4			4
Cruiser (CGN)			9			9			9			9
Cruiser (CG)		4	25		3	28		2	30		3	33
V/STOL cruiser (CGV)			0			0			0			0
Destroyer (DDG)	1		40	1		39			39	1		38
Destroyer (DD)	2		43	4		39	4		35	4		31
Frigate (FFG)		4	54			54			54			54
Frigate (FF)			59			59			59			59
Submarine (SSN)		4	107	1	3	109	2	1	108	2		106
Submarine (SS)			5	1		4	1	1	4	2		2
Small combat (PG/PHM)			6			6			6			6
Subtotal, Combatants			365			364			362			356
Amphibious Ships												
Helo assault ship (LHA/LHD)			5			5			5		1	6
Dock transport (LPD)			13			13			13			13
Helo transport ship (LPH)			7			7			7			7
Landing ship dock (LSD)	2	1	9	2	4	11		3	14		3	17
Landing ship tank (LST)			20			20			20			20
Command ship (LCC)			2			2			2			2
Assault transport (LKA)			5			5			5			5
Subtotal, Amphibious			61			63			67			70
Mine warfare ships												
Ocean minesweeper (MSO)	2		2	1		1			1	1		0
Mine warfare ship (MCM)		1	1		4	5		4	9		4	13
Mine warfare ship (MSH)			0			0			0		1	1
Subtotal, Mine Warfare			3			6			10			14
Replenishment Ships												
Station ship (AOE)			4			4			4			4
Station ship (AOR)			7			7			7			7
Oiler (AO/TAO)	4	1	12		2	14		2	16		2	18
Ammo. ship (AE/TAE)			13	2	1	12		1	13	2	1	12
Stores ship (AFS/TAFS)			9			9			9			9
Subtotal, Replenishment			45			46			49			50
Material Support Ships												
Destroyer tender (AD)			6		1	7			7		1	8
Submarine tender (AS)	1		9			9			9		1	10
Repair ship (AR)			0			0			0			0
Subtotal, Material Sup.			15			16			16			18
Fleet Support Ships												
Surveillance ship (TAGOS)			12			12			12			12
Salvage ship (ARS)	3	2	7	3		4			4			4
Rescue ship (ASR)	2		3	1		2			2			2
Salvage/rescue ship (ATS)			3			3			3			3
Fleet tug (ATF/TATF)			7			7			7			7
Subtotal, Fleet Sup.			32			28			28			28
Total, General Purpose			521			523			531			536
Total, All Ships			559			563			571			577

(Continued)

TABLE D-2. (Continued)

Ship Type	1990 Re-tire	1990 Add	1990 End	1991 Re-tire	1991 Add	1991 End	1992 Re-tire	1992 Add	1992 End	1993 Re-tire	1993 Add	1993 End
Strategic												
SSBN (Poseidon)			31			31			31	6		25
SSBN (Trident)		1	11		1	12		1	13		1	14
Total, Strategic			42			43			44			39
General Purpose												
Combatants												
Aircraft carrier (CVN)			5			5		1	6			6
Aircraft carrier (CV)			9			9			9			9
Battleship (BB)			4			4			4			4
Cruiser (CGN)			9	1		8	1		7			7
Cruiser (CG)		3	36		3	39	1		38	4		34
V/STOL cruiser (CGV)			0		1	1			1		2	3
Destroyer (DDG)	6	1	33	9		24	9	12	27	5	12	34
Destroyer (DD)			31			31			31			31
Frigate (FFG)			54			54			54			54
Frigate (FF)	4	1	59			59			59	1		58
Submarine (SSN)	1	2	103	6		97	3		94	3	1	92
Submarine (SS)			3		2	5		2	7		3	10
Small combat (PG/PHM)			6			6			6			6
Subtotal, Combatants			352			342			343			348
Amphibious Ships												
Helo assault ship (LHA/LHD)			6		1	7		1	8		1	9
Dock transport (LPD)		1	14			14	1	1	14	1	1	14
Helo transport ship (LPH)			7	1		6	1		5	1		4
Landing ship dock (LSD)		4	21			21			21			21
Landing ship tank (LST)			20			20			20			20
Command ship (LCC)			2			2			2			2
Assault transport (LKA)			5			5			5			5
Subtotal, Amphibious			75			75			75			75
Mine Warfare Ships												
Ocean minesweeper (MSO)			0			0			0			0
Mine warfare ship (MCM)		5	18			18			18			18
Mine warfare ship (MSH)			1		3	4		3	7		3	10
Subtotal, Mine Warfare			19			22			25			28
Replenishment Ships												
Station ship (AOE)			4			4		1	5		1	6
Station ship (AOR)			7			7			7			7
Oiler (AO/TAO)		3	21		2	23		3	26		2	28
Ammo. ship (AE/TAE)	1	1	12			12		1	13		1	14
Stores ship (AFS/TAFS)			9			9			9			9
Subtotal, Replenishment			53			55			60			64
Material Support Ships												
Destroyer tender (AD)	1	1	8		1	9		1	10		1	11
Submarine tender (AS)		1	11			11			11			11
Repair ship (AR)			0			0			0			0
Subtotal, Material Sup.			19			20			21			22
Fleet Support Ships												
Surveillance ship (TAGOS)			12			12			12			12
Salvage ship (ARS)			4			4		2	6			6
Rescue ship (ASR)			2			2			2			2
Salvage/rescue ship (ATS)			3			3			3			3
Fleet tug (ATF/TATF)			7			7			7			7
Subtotal, Fleet Sup.			28			28			30			30
Total, General Purpose			546			542			554			567
Total, All ships			588			585			598			606

(Continued)

TABLE D-2 (Continued)

Ship Type	1994 Re-tire	1994 Add	1994 End	1995 Re-tire	1995 Add	1995 End	1996 Re-tire	1996 Add	1996 End
Strategic									
SSBN (Poseidon)	13		12	4		8	7		1
SSBN (Trident)		1	15		1	16		1	17
Total, Strategic			27			24			18
General Purpose									
Combatants									
Aircraft carrier (CVN)			6		1	7			7
Aircraft carrier (CV)			9	1		8	1		7
Battleship (BB)			4			4			4
Cruiser (CGN)			7			7			7
Cruiser (CG)	4		30	2		28	3		25
V/STOL cruiser (CGV)		3	6		3	9		3	12
Destroyer (DDG)	5	12	41		12	53		12	65
Destroyer (DD)			31			31			31
Frigate (FFG)			54			54	1		53
Frigate (FF)	1		57	4		53	2		51
Submarine (SSN)	2	1	91	2		89	1	1	89
Submarine (SS)			10			10			10
Small combat (PG/PHM)			6			6			6
Subtotal, Combatants			352			359			367
Amphibious Ships									
Helo assault ship (LHA/LHD)		1	10		1	11		1	12
Dock transport (LPD)			14	2	1	13	1	1	13
Helo transport ship (LPH)			4	1		3	1		2
Landing ship dock (LSD)			21			21			21
Landing ship tank (LST)			20			20			20
Command ship (LCC)			2			2			2
Assault transport (LKA)			5			5			5
Subtotal, Amphibious			76			75			75
Mine Warfare Ships									
Ocean minesweeper (MSO)			0			0			0
Mine warfare ship (MCM)			18			18			18
Mine warfare ship (MSH)		3	13			13			13
Subtotal, Mine Warfare			31			31			31
Replenishment ships									
Station ship (AOE)	1	1	6		1	7		1	8
Station ship (AOR)			7			7			7
Oiler (AO/TAO)	1	2	29	3	2	28	2	3	29
Ammo. ship (AE/TAE)			14		1	15		1	16
Stores ship (AFS/TAFS)	2		7		1	8		1	9
Subtotal, Replenishment			63			65			69
Material Support Ships									
Destroyer tender (AD)		1	12		1	13		1	14
Submarine tender (AS)			11		1	12		1	13
Repair Ship (AR)			0			0			0
Subtotal, Material Sup.			23			25			27
Fleet Support Ships									
Surveillance ship (TAGOS)			12		3	15			15
Salvage ship (ARS)			6			6			6
Sub, rescue ship (ASR)			2			2			2
Salvage/rescue ship (ATS)			3			3			3
Fleet tug (ATF/TATF)			7			7			7
Subtotal, Fleet Sup.			30			33			33
Total, General Purpose			575			588			602
Total, All ships			602			612			620

APPENDIX E. OPEN-OCEAN DESTROYER (DDGY)

This appendix contains excerpts from the CBO study Naval Surface Combatants in the 1990s: Prospects and Possibilities, April 1981. These excerpts describe the DDGY and some other surface combatants referred to in this report.

> The open-ocean destroyer, which for convenience is designated DDGY, is illustrative of a warship that would result from different choices on the design trade-off issues from those taken by the Navy for the DDGX. 1/ It would be an offensively oriented surface combatant capable of battle group operations, but optimized more for broad-ocean operations in the context of a worldwide naval war rather than for the intensive, frontal assault scenario used to derive the DDGX requirements.
>
> The DDGY would carry the same vertical launching system and the same missiles, including cruise missiles, as the DDGX. It would be significantly smaller than the DDGX, however, because of the effect of the design trade-offs discussed below and because, unlike the DDGX, it would not have space and weight capacity for unspecified future growth.
>
> In anti-air warfare (AAW), the DDGY would emphasize "back-end" technology and would use an advanced missile fire control system to achieve high firepower at shorter ranges. 2/ It would use the advanced SM-2 AAW missile, and would have the long-range area AAW capability of that missile. Although this system would probably be less capable, particularly in a jamming environment, than the one proposed for the DDGX or AEGIS, it should be considerably less expensive than AEGIS and much more

1/ DDGX is now referred to by the Navy as the DDG-51.

2/ The term "back-end" refers to the missile fire-control function of an AAW system as opposed to the search and detection functions.

capable than any of the pre-AEGIS AAW systems on existing cruisers and destroyers.

In antisubmarine warfare (ASW), the DDGY emphasizes long-range passive detection with a towed-array sonar whereas the DDGX emphasizes active detection using the SQS-53 sonar. The DDGY would also be fitted with an active sonar, but would utilize the smaller SQS-56 rather than the larger, more expensive SQS-53 used by the DDGX. The DDGY would carry two LAMPS III helicopters, which are essential to its long-range ASW orientation and would also provide it with an independent over-the-horizon surveillance and targeting capability.

The DDGY is assumed to have the same propulsion system as the DDGX; but being a smaller ship, it would be a bit faster. Its range, however, would be about 10 percent less than that of the DDGX.

Finally, the DDGY would be fitted with a gun and a relatively simple gun fire control system suitable for surface engagements and shore bombardment. Although a gun is unlikely to be useful in a modern battle group engagement, it could still be vital for independent patrol and presence operations and for support of amphibious landings.

Emphasizing long-range towed-array ASW rather than shorter-range active sonar, carrying its own helicopters rather than relying upon those from other ships, and mounting a large-caliber gun for antisurface and shore bombardment missions, the DDGY would be better equipped for independent operations outside of the battle group than would the DDGX.

In addition to carrier battle group operations, the DDGY could operate with surface action groups. In this role, its aircraft would provide over-the-horizon surveillance and its towed-array sonar would provide long-range detection of submarines. The DDGY could also operate in support of amphibious landings, providing AAW and ASW protection en route and gunfire support during the assault. It could also operate with frigates in escorting replenishment ships and convoys, substantially increasing the protection provided. Finally, the DDGY could operate independently in patrol and presence or ocean area control missions.

The characteristics of the DDGX and DDGY destroyers and CGN-42 (nuclear) and CG-47 (AEGIS) cruisers are shown in Table E-1, which reproduces Table 3 from the CBO study Naval Surface Combatants in the 1990s: Prospects and Possibilities. The characteristics shown for DDGX in the table represent those for the design baseline of the ship now designated DDG-51 as they were defined in April 1981. Figure E-1 presents simple drawings of these four types of ships. Table E-2 illustrates the deriviation of DDGY displacement and cost, using the FFG7 as the baseline. This figure and table reproduce Figure 5 and Table D-2 in the April 1981 study.

TABLE E-1. CHARACTERISTICS OF ALTERNATIVE SHIP TYPES

	Nuclear Cruiser (CGN-42)	AEGIS Cruiser (CG-47)	Battle Group Destroyer (DDGX) a/	Open Ocean Destroyer (DDGY) b/
Displacement (tons)	12,000	9,100	6,000	5,000
Maximum Speed (knots)	30+	30	29	30
Endurance Speed (knots)	--	20	18	20
AAW Systems				
Search radar	SPY-1	SPY-1	MFAR	3-D c/
Fire control radar	4 MK99	4 MK99	2 MK99 or 2 Agile Beam	2 Agile Beam d/
Launcher system	VLS	VLS	VLS	VLS
Missile capacity	122	122	90	90
Missile type	SM-2	SM-2	SM-2	SM-2
ASW Systems				
Towed-array sonar	SQR-19	SQR-19	None	SQR-19
LAMPS-compatible	Yes	Yes	Yes	Yes
Number of aircraft	Two	Two	None	Two
Hull-mounted sonar	SQS-53	SQS-53	SQS-53	SQS-56
ASW weapons	ASROC/MK32 Tubes	ASROC/MK32 Tubes	ASROC/MK32 Tubes	ASROC/MK32 Tubes
ASuW Systems				
Missiles	Tomahawk (TASM)	Tomahawk (TASM)	Tomahawk (TASM)	Tomahawk (TASM)
Guns	Two 5"/54	Two 5"/54	None	One 155mm (6")
Land Attack Systems				
Missiles	Tomahawk (TLAM)	Tomahawk (TLAM)	Tomahawk (TLAM)	Tomahawk (TLAM)
Guns	Two 5"/54	Two 5"/54	None	One 155mm (6")
Estimated Cost (millions of fiscal year 1982 dollars)	$1,340	$1,018	$550	$375

a/ A final decision on the configuration of the DDGX has not yet been made. The characteristics listed above may be changed by the Navy as the design process progresses.

b/ For DDGY weight and cost rationale, see Table E-2.

c/ SPS-48E 3-D and SPS-49 2-D air radars as used on the latest U.S. ships supplemented by horizon and high-elevation search by agile beam fire control radars. Later units might have a new-generation air search radar.

d/ Agile beam is used here as a generic term that includes such specific concepts as the Terminal Engagement Radar (TER) or Flexible Adaptive Radar (FLEXAR). This system would be capable of simultaneously tracking and engaging multiple targets while supplementing the air search function in the horizon and zenith areas.

Figure E-1.
Four Alternative Ship Types

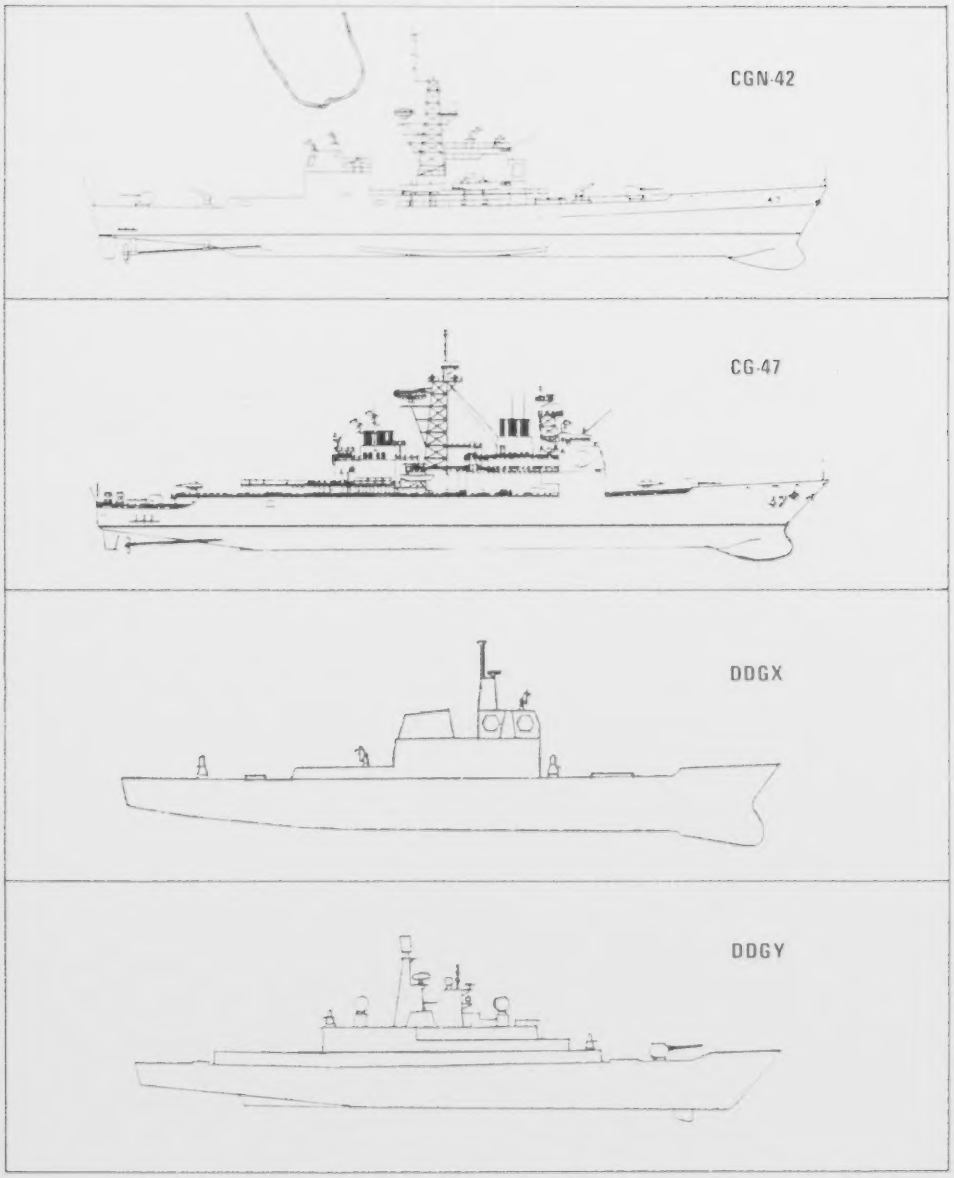

TABLE E-2. DERIVATION OF DDGY DISPLACEMENT AND COST USING FFG-7 AS BASELINE

Feature	Differences DDGY	vs. FFG-7	Displacement Effect (Tons)	Cost Effect (Millions of 1982 dollars)
AAW System	New Agile Beam System	MK92/STIR	+75	+10.0
	SPS-48E	No 3-D Radar	+75	+10.0
Missile Launcher	90-cell VLS	MK13 Launcher	+350	+16.0
Speed	30 knots	28 knots	+400	+6.6
Gun	155mm	76mm	+20	+5.0
Range	10 percent higher	--	+130	+0.7
Overpressure	7 psi	3 psi	+100	+3.3
Fragment Protection	Level I	Inherent	+160	+5.5
Total Difference			+1,310	+57.1

Resulting Displacement and Cost Estimate

Displacement (Tons)	
FFG-7	3,600
Difference	+1,310
DDGY Displacement	4,910
Cost (Millions of 1982 Dollars)	
FFG-7	280
Difference	+57
DDGY Cost	337

APPENDIX F. BASIS FOR BUDGET AUTHORITY ESTIMATES FOR OPTIONS I THROUGH IV

DEFENSE RESOURCES MODEL

With the exception of certain procurement and manpower estimates, annual budget authority requirements cited for Options I through IV of this paper were generated by the CBO Defense Resources Model (DRM). Designed to provide an unclassified estimate of defense costs in the current fiscal year, plus the Defense Department's most recent Five-Year Defense Plan (FYDP), the DRM spans a six-year period. Initial input to the DRM is program element data for the first year of the FYDP, reaggregated into declassified form. This input is then updated to reflect final budget decisions as reflected in Congressional appropriations bills. DRM estimates are generally made in constant dollars based on the first year of the six-year period covered by the model. The base year for Options I through IV was fiscal year 1982; all figures were converted to fiscal year 1983 budget dollars, using CBO inflation estimates of January 1982.

OUT-YEAR FORCES

The DRM is structured so that the addition or deletion of any one force element will not only produce changes in direct accounts of that force element, such as manpower and operations and maintenance, but also the appropriate support tail. These automatic adjustments are derived from the relationships which exist in the base year, various factors manuals, and, in the case of such new weapons systems as the F/A-18 aircraft, specific service-generated information. As a result of this process, only certain procurement data needs to be manually produced.

Assumptions

The most significant assumption made for Options I through IV was that the relationships that existed among elements in the fiscal year 1982 program would continue into the out-years. Since Department of Defense (DoD) policy with regard to manning levels,

operations and maintenance requirements, and support functions could change, out-year estimates could easily vary over time. It was assumed that Navy Research and Development (R&D) would continue at a constant level after 1987. Procurement schedules for aircraft and weapons were based on those used in the March 1981 Congressional Data Sheets and September 1981 Selected Acquisition Reports (SAR), if they were different from the former.

Navy/Marine Corps Overlap

Navy and Marine Corps dollars were aggregated to reflect force interactions; that is, certain Marine Corps expenditures were included in Navy budget authority for fleet activity and support forces. About $0.5 billion fell into this category in 1982. Likewise, certain Navy expenditures vary with Marine Corps force levels. These variable elements, such as aircraft operations and maintenance and medical personnel, were over $2 billion in 1982. Total Department of the Navy budget authority includes both Navy and Marine Corps related budget authority.

Procurement

Certain procurement costs were generated by the DRM. Among these are cost growth, inflation, and other miscellaneous elements of the Weapons Procurement, Navy, and Aircraft Procurement, Navy (WPN and APN) accounts, which occur routinely and often vary with force size. The ratios of these elements to investment costs that existed in fiscal year 1982 were assumed to hold for every year of every option.

The remaining procurement data was manually derived:

- Figures for Shipbuilding and Conversion, Navy (SCN) were those presented in detail for each option in Appendixes A through D. New construction was assumed to account for 80 percent of total SCN. No DRM estimates were used.

- APN requirements varied with the maximum number of carriers for each option. Existing procurement rates in the March 1981 Congressional Data Sheets were assumed adequate to sustain existing force levels, with additional aircraft added to the end of present total programs in most cases. Fifteen-year service life was used for all aircraft.

- WPN requirements were assumed to be a function of force changes. For example, a one-quarter increase in carrier air wings or combatant ships, would generate a one-quarter increase in all appropriate WPN systems beyond the total programs to be procured in the September 1981 SARs or March 1981 Congressional Data Sheets. Ballistic missiles requirements were determined separately.

GLOSSARY

GLOSSARY

AAW: Anti-air warfare.

AE: Ammunition ship.

AEGIS: New anti-air warfare system developed by the Navy.

AFS: Stores ship.

AGOS: Surveillance ship.

AO: Fleet oiler.

AOE: Fast combat support ship.

AOR: Replenishment oiler.

ARS: Salvage ship.

ASuW: Antisurface warfare.

ASW: Antisubmarine warfare.

BB: Battleship.

CG: Guided missile cruiser.

CGN: Nuclear-powered guided missile cruiser.

CGV: Aviation guided missile cruiser.

CIWS: Close-In Weapon System; also known as "Phalanx".

CV: Conventionally-powered aircraft carrier.

CVN: Nuclear-powered aircraft carrier.

DD: Destroyer.

DDG: Guided missile destroyer.

GLOSSARY (Continued)

ECM: Electronic countermeasures.

ECCM: Electronic counter-countermeasures.

FF: Frigate designation.

FFG: Guided missile frigate.

FLEXAR: Flexible adaptive radar.

HARPOON: Intermediate-range antiship cruise missile.

ICW: Interrupted continuous-wave illumination.

LAMPS: Light airborne multipurpose system; specially outfitted helicopters deployed on surface combatants.

LHA: Amphibious assault ship.

LHD: New-design amphibious assault ship.

LPD: Amphibious transport, dock.

LSD: Landing ship, dock.

LST: Landing ship, tank

MCM: Mine countermeasure ship.

MFAR: Multi-function array radar.

MK32 Tubes: Torpedo tubes for launching antisubmarine torpedoes.

MK99 Fire Control System: Missile fire control system used with the AEGIS anti-air warfare system.

MSH: Small minehunting ship.

OTH: Over-the-horizon.

GLOSSARY (Continued)

PCW: Pulsed continuous-wave illumination.

SAG: Surface action group.

SM-1: Basic version of the Navy's Standard anti-air missile.

SM-2: Advanced version of the Navy's Standard anti-air missile.

SPY-1: Phased-array air search radar used in the AEGIS anti-air warfare system.

SQR-19: Designation for a tactical towed-array sonar system deployed on surface combatants.

SQS-53: Large, hull-mounted active sonar.

SQS-56: Small, hull-mounted active sonar.

SS: Conventionally-powered attack submarine.

SSN: Nuclear-powered attack submarine.

SSBN: Nuclear-powered ballistic missile submarine.

TACTAS: Tactical towed-array sonar.

TAE: Civilian manned ammunition ship.

TAGOS: Civilian manned surveillance ship.

TASM: Tactical antiship missile.

TER: Terminal engagement radar.

TERCOM: Terrain comparison guidance.

TLAM: Tactical land attack missile.

TOMAHAWK: Long-range cruise missile used against ships (TASM) and land targets (TLAM).

TWS: Track while scan.

VLS: Vertical launching system.

V/STOL: Vertical/short takeoff and landing aircraft.